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ABSTRACT

This document includes reports prepared by teachers on their year's work in the Thirteen-College Curriculum Program (TCCP). It concerns the project of seeking to develop a curriculum based on the learner as doer, not as the passive recipient of knowledge defined by someone else. It is intended to serve as a guide for teachers. This document asked teachers to list the components of the TCCP program that they are actually using and to give anecdotal accounts of a few things that impressed them most about the project, either because they proved so effective or not. The first part of this document presents the introduction; the second part presents notes on the curriculum for 1967-68, which is a summary of selected aspects of the year's reports. It begins with a preface on student goals (learn skills, learn to think, learn something important, develop positive attitudes, and become involved in project activities). The second part continues with an account of 4 features that serve to distinguish the project from conventional curriculums. The third and final part poses questions about the project to help set the teacher's reports in terms of the present framework. (Author/PG)

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GUIDE FOR TEACHERS

FOR EVALUATING THE MATERIALS AND PRACTICES

OF THE THIRTEEN-COLLEGE PROJECT

February 20, 1969

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ONE: INTRODUCTION

The project is seeking to develop a curriculum based on the learner as doer, not as the passive recipient of knowledge defined by someone else. But it is one thing to hold this principle and to seek to embody it in teaching materials, it is another to determine whether these hopes and plans are actually being realized. The present document requests your help in determining what is actually going on in classrooms and on the campus. We know people can offer educational visions and write nice curriculum units, but what is the experience emerging from several hundred classrooms?

Last spring near the close of the academic year, we asked teachers to prepare reports of the year's work. A summary of selected aspects of these reports constitutes the bulk of the present document and should serve as a guide for teachers in preparing this year's reports. The summary states the objectives of the project, as it emerges from the reports, and then, using illustrative material drawn mostly from the reports, examines how well we lived up to them. Some results are established, but many questions are still open.

There are a variety of ways to get information about actual practices in classrooms and on the campus -- through reports by students, through independent observers visiting classes, through examination of student work, and through the teacher's own perception of what he is doing and how things are working out. The present effort is devoted to this last method.

We are asking teachers to list the components of the program that they are actually using and to give anecdotal accounts of a few of the things that impressed them most about the project, either because they proved so effective or such a flop. What is so different about what you are doing? What new things have you shown to be possible?

The reports by teachers have several uses. The immediate audience includes other teachers in the program and the people in the Curriculum Resources Group and the Evaluation Group. In planning next steps we all need to know what worked and what did not.

Ultimately, we hope to reach a broader audience -- teachers at other colleges, educational authorities, and members of the general public interested in education. We plan to start publishing, on a non-profit basis, a new literature about education. The materials would include both curriculum units and accounts by teachers of what actually happened in classrooms.

Efforts toward finding out what works and does not work in the classroom have already been started by some of the Curriculum Resources people and some of the directors. Teachers who have already produced reports in such efforts will find them useful in carrying out the present task.

The project as a whole is engaged in two kinds of evaluation, evaluation of procedures and evaluation of outcomes. The first kind of evaluation includes the present effort to determine whether we are actually achieving in the classroom what we are trying to achieve. The second kind of evaluation includes the more familiar comparative studies of what is happening to students in terms of their performance on standardized tests of educational achievement and attitudes.

Reports Due April 30

The reports by teachers should be given to the directors by April 30, 1969. The directors will keep at least one copy for local records and mail one copy to the Curriculum Resources Group (our Newton office), in care of Frederick Humphries, and one copy to the Institute for Services to Education (our Washington office), in care of Joseph Turner. There will be an opportunity to discuss the preparation of the reports at the forthcoming Atlanta Meeting, March 7-9. We hope teachers will start working on their reports now, keeping track of what materials they are using, gathering illustrations, and generally thinking about what they will want to say in the reports.

Reports should not be anonymous. You should affix your name to what you have written. If you have any questions about the task, please talk to your director, or phone Joseph Turner collect, (202) 232-7175.

How to Use This Document

Our approach to evaluation requires the teacher to do a certain amount of reading before settling down to prepare his report. The present document is divided into three parts. Teachers should read the first two parts for general background, for illustrations of what is needed, before starting to answer the specific questions asked in the third part.

The first part, "Introduction," is the present section.

The second part, "Notes on the Curriculum: 1967-68," is the summary of selected aspects of the first year's reports. It begins with a preface on "Student Goals."

The preface distinguishes five goals -- become involved in project activities; learn skills, including basic skills; learn to think, and develop taste and judgement; learn something important in subject areas studied; and develop positive attitudes towards oneself and towards learning. This account of goals is designed to be equally applicable to all subjects taught in the project. It should be as useful to a teacher of, say, "Ideas and Their Expression" as to a teacher of "Quantitative and Analytical Thinking."

The second part continues with an account of four features that serve to distinguish the project from conventional curriculums. These categories are not so much four slices of the pie as four perspectives from which to view it. The perspectives are: "Themes, or Subject Groupings, or Story Lines" (a fresh appraisal of what hangs together in a course, in contrast to the usual selection of topics because they make up the "disciplines" or because that is what is usually covered in the freshman year); "Written Materials" (use of paperbacks, magazines, etc., in contrast to the usual textbook); "Audio, Visual and Laboratory Materials, and Field Trips" (use of films, tapes, open-ended experiments in science, street corner research in sociology, in contrast to the usual reliance on written materials and laboratory demonstrations); and "Teaching Practices and Techniques" (in English, for example, students stage and dramatize literary works, in contrast to the usual procedure of writing book reports).

Hitherto, in attempting to characterize the Thirteen-College Curriculum, we have proceeded by taking the courses one by one and describing them, "Quantitative and Analytical Thinking," "Social Institutions," and so on. The present account proceeds differently. It cuts across these divisions to offer a set of categories based on the kinds of instructional materials and practices employed in the project. Thus, comparable aspects of the different courses fall into juxtaposition. This makes comparisons in approach in different courses possible, suggests the application of achievements in one course to another, and generally brings out the educational philosophy underlying the project.

The third and final part, "The Questions," poses questions about the project, to help set the teachers' reports in terms of the present framework.

To repeat, the scheme requires the teacher to do a certain amount of reading before starting to answer the questions and to write his report. We urge teachers to read not only those parts dealing with their own courses, but also those parts dealing with other courses. Work in another field may have implications for your own teaching efforts.

Need for Anecdotal Material and Explanations

Reports by the the teachers will enable the project as it advances, to profit from its own experience. Use of the reports on the individual campuses will provide a continuing record of local achievements and provide the basis for a collection of materials for study by other interested teachers and visitors. Reports will also serve as background reading for all participants in the 1969 Summer Conference, serving especially to introduce new teachers to the program. Reports will be used by ISE and CRG people in fulfilling their responsibilities for providing a comprehensive description of what is going on in the program, and developing new moves with teachers for the 1969-70 academic year.

The hope of the project is to have a broad impact on higher education, not just help improve the colleges in the consortium. One source of influence will be publication of selected materials. This will include curriculum units and accounts by teachers of what actually happens in classroom as well as samples of students' work, descriptions of the summer conferences, and accounts of changes that have occurred in the participating colleges as a result of the project.

We hope, accordingly, that teachers will give careful thought to their reports and provide extended anectodal accounts of teaching procedures when they have something particularly interesting to relate.

In last year's reports, the tendency was for teachers simply to say this worked and that did not, but not to hazard guesses as to why. Some teachers enclosed voluminous collections of student work -- problems worked, compositions written, research compiled, exams taken. Student work is helpful as supporting illustrations, but it is not useful when simply thrown at the reader as so much raw data.

If experience gained working in the classroom is to be cumulative, the teacher must report what he did in sufficient detail. It may be that when one teacher reports "X" worked and another reports the opposite that they are really talking about different things. Detail is necessary to determine whether, under the heading "X," both teachers were really following the same procedures --

or what procedures they were following. Disagreement in results is fine. Different teachers are successful in different ways, but it is necessary to know what one is disagreeing about. The longer quotations employed in "Notes on the Curriculum: 1967-68" are illustrative of the kind of reporting that is useful, although many of these accounts could profitably have been developed at greater length (a few were).

Some ingenuity is required in seeking ways to determine whether a given item has impact on students. Last year several teachers found it helpful to note whether students subsequently referred back to, or made use of, works read or studied earlier. A teacher of "Quantitative and Analytical Thinking," and a teacher of "Ideas and Their Expression," both used this criterion.

Teacher A: "That so many interesting patterns and number sequences could be obtained from an examination of Pascal's Triangle, really impressed many students -- so much so, in fact, that in many discussions that followed during the year, students almost always looked for new discoveries involving Pascal's Triangle."

Teacher B: "The discussion of the Packard and Huxley excerpts was very lively, and throughout the year the students related material and ideas back to this material."

In fine, the reporting task set for teachers in this effort to evaluate the project and its components is not so different from any reporting assignment.

TWO: NOTES ON THE CURRICULUM: 1967-68

PREFACE: STUDENT GOALS

1. Involvement in Project Activities

On the basis of their experience in elementary and secondary schools, students in the project came to college with certain expectations as to what education is like. They expected textbooks, memorization, being told what to learn and when to learn it, and then being tested on how well they had carried out orders. Many teachers report that students initially were made uncomfortable by the new approach. They waited for the teacher to parcel out the goods, and when the goods were not forthcoming, they felt cheated. This feeling was reinforced when the students found that their friends in the regular college program were continuing to get the old, familiar stuff. But after a certain period of time, a period that had to be worked through, so reports from many teachers continue, students behaved less passively, they began to take a more active part in classrooms. They accepted the new approach, found that they liked it better and that it was more effective.

Teachers in all fields support the necessity first to overcome student conservatism. To consider first the teaching of science, here are some typical comments. Two teachers discuss student expectations. A third teacher hazards the guess that the student's own difficulty with reading lay at the root of his preference for lectures. A fourth teacher reports on the gradual acceptance of the program in the course of the year.

Teacher A: "Initially (the inductive approach) appeared to be unsuitable to the rigid, oriented students that enter this college. They wanted the instructor to lecture so that they could memorize the facts with no appreciation for their physical application just as they have been doing all of their lives. Therefore, when they were first exposed to this teaching method, they felt quite uncomfortable and were reluctant to attempt to critically analyze the scientific material because they had been told all of their lives to be good, quiet boys and girls and do nothing to question the omniscient instructor. As a result, they had developed the intrinsic feeling that science is a mere collection of facts divorced from their life experiences. Therefore, considerable time and efforts were invested in destroying the myths and prejudices that the students brought to class by generating discussions about phenomena related to their lives and having them carry out laboratory activities to substantiate or discard their beliefs. Once the students got involved in the activities they found the work enjoyable and very rewarding. They became inquisitive and voluntarily spent extra time in an effort to solve their difficulties."

Teacher B: "Because of the disciplined atmosphere to which they were accustomed, many adjustments had to be made both on the part of the instructor and the student. For example, some students had to be coerced in private meetings to voice their opinions and take an active part in classroom discussions. Their previous disciplined environment was also reflected in classroom discussions themselves and outside the class. Many tended to take the instructor's and/or give a text's opinion as being beyond error. Many times the instructor would intentionally make erroneous blunders and in turn ask their opinion on his comment. This disciplined atmosphere also reflected itself in the awe students experienced at first encounter of experiments they thought could only be carried out as outlined by a text and/or their discovery of a new procedure which worked just as well. At first, this open-ended procedure disturbed many students."

Teacher C: "Observation of several students led me to the conclusion that these students had not developed the desire or motivation to read, and they wanted the instructor to transform reading assignments into lectures rather than discuss them in class."

Teacher D: "When they first came to me I thought they would never start asking questions and forming their own hypothesis. I had to ask a large number of leading questions. At the end of the semester, they were asking me questions, sometimes all at once. They challenged my answers to such an extent that we all decided to do further reading."

These same points are noted by teachers in other courses -- the students' initial reluctance to engage in project activities, even to speak up in class. A teacher of mathematics writes:

Teacher E: "Students were quick to ask such questions as 'What's the formula?', 'How do you want us to do it?' and 'Will you test us on that?'. Their orientation toward college work and learning seemed to indicate that students believed that college courses essentially involved (1) memorizing what the teacher indicated was important, (2) demonstrating success in memorizing these things (usually on a written test), and then (3) forgetting the material since it was really no longer important after tests."

In Social Institutions, one teacher reports: "The greatest dilemna came in those discussions where students desired and often demanded a 'right' or 'wrong' evaluation placed on their responses by the teacher." Another teacher notes that students in the main "expect to recite and to feedback memorized lecture notes on examinations." Another teacher writes, "They were simply not accustomed to this manner of thought. They were still groping for rote memorization -- and their crutch, the textbook." And still another teacher: "Some students will want to rely on one particular text instead of broadening their scope of knowledge by reading many titles."

In English, teachers also report the initial difficulties caused by student expectations based on school experience. Some typical comments:

Teacher A: "From observations, I ascertained that most of my students were not accustomed to speaking freely in class, were not sure of themselves or of their having ideas worthy of consideration by others, and were not accustomed to freedom of expression and self-control. . . ."

Teacher B: "I found, particularly at the beginning of the year, that students were much more willing to listen to - and to argue with - other students than they were with me. As much as possible, then, it is advisable to set up the classroom sessions so that they will be directed by a particular student or by a group of students. In this situation, the instructor operates primarily as a director who sets certain wheels in motion and keeps them well oiled and operating at peak efficiency."

Teacher C: "Almost all the students . . . had read approximately the same things in high school (I discovered this by asking them who their favorite poets were and which they had read) and most had learned under a rote memorization system. . . .

The question of involvement, of whether students get to work, is not limited to willingness to talk, or to express oneself in class. It must also consider whether students willingly start writing and reading. Many teachers report that students heartily disliked writing. The question is whether the activities of the project are more effective in promoting writing than such traditional methods as assigning themes. Teachers report different results. One teacher reports success, a second teacher reports difficulties, a third reports success after some jockeying around to find the appropriate activity.

Teacher D: "When I asked the students if they would like to write their "Moments of Truth" as suggested by the unit, there was no reluctance to talk about what they would like to say in their papers. However, only one student talked about his first awareness of being a Negro. This was the first time in the seven years that I have taught freshman English that there was no resistance to writing or complaining that 'I have nothing to write about.'"

Teacher E: "Contrary to our expectations that students would welcome the opportunity to write even the things of their own choosing, they hated writing almost anything. They enjoyed the discussion, but not the expectation that they write. They finally began to write, but they immediately demanded their pay in the form of grades. The clamor became so great that we finally conceded to their demands. We tried at first to get around their demands by writing comments which we felt were both encouraging but candid. When this effort failed to satisfy, we then began to affix letter grades. . ."

Teacher F: "The instructor encouraged these students to talk freely, then with dictaphone, taped their responses to questions and their comments. These were transcribed in order to demonstrate to the student the relationship between the spoken and written word, and to remove the psychological barrier to written expression that some students felt."

One of the directors also commented on student reactions to project activities and the slow process of gaining acceptance.

Director G: "Students who are suddenly exposed to new sets of values and to new methods will sometimes react with fear and even anger, as when a psychiatrist's patient begins to react with anger to the things he newly confronts. Thus, students in the 13-College Program were rarely placid, often disturbed and confused, nearly always on the edge of anger. Traditional and unchallenging courses would not have produced these reactions. Staff members were themselves disturbed by self-doubts, often because of the very criticisms students were encouraged to make."

Considering the first goal as a whole, the involvement of students with project activities, the project overcame an initial demand from students for more of the same, and began to instill an interest in students in working more on their own. As one teacher put it, the project effected "a transition from the rigid language of high school to individual freedom and responsibility." But teachers also agreed that much remains to be done, and the degree of success varies from subject to subject, teacher to teacher, and student to student.

2. Learn Skills (including basic skills) in the Process

Assuming that students do become involved in project activities, that the materials do engage the student's interest and energy, the next question is whether the student begins to learn basic and more advanced skills as he does the new work.

The question concerns all fields, skills in English, mathematics, science, and so on. Starting with English, teachers of the subject report that students have difficulty in the basic skills of reading, writing, and speaking. Teachers of the other subjects also comment, regarding basic skills in English, that students have difficulty here. Some of their comments are also included in the following collection of comments on difficulties.

Teacher A: "The main problem I encountered (this from a teacher of Social Institutions) was communication: the students generally had great difficulty in expressing themselves, both in writing and in speaking."

Teacher B: "Thirty to fifty per cent of our students are seriously deficient in their ability to read, to express themselves, both in writing and in speaking."

Teacher C: "If we define a speech problem as any deviation from normal speech that calls attention to itself or to the speaker in a negative way, then practically all the students in the program could be said to have a speech problem. . . (Here is a) sample of structural deviations and non-standard expressions:

"'I've done did it'

"'Ain't no way'

"'D'em ain't the ones'

"'My man' (referring to actor, friend, particular teacher, clerk, etc.)

"'Have the bell rung?'

"'You got it!'

"'Often (often)

"'mucho' (much)

"'yo' (your)

"'Able to get around good enough'

"'You know' (a crutch which is used repeatedly in a sentence)

"'they's done gone' (they have left)

"'Dis' (this)

"'Hisself' (himself)

"'They wasn't a God'

"'She longs to be ridden of this great burden'

"'I cannot recall a time whereas I have not dreamed of becoming a college graduate.'

"'Perhaps, it could be a person who you really do not know, but whom you would like to help.'"

(An aside on another aspect of the project must be offered at this point. This concern with basic skills in English has to be seen in the context of an equally valid concern with "Voice", both in spoken and written expression. Voice has to do with the rhythms and construction of language, and with such broad properties of tone as irony, sympathy, distance, passion, put-on, etc. From this prespective non-standard expressions are of interest and part of the subject of language and literature.)

Teacher D: "I became aware of some of the student's inabilities to use the dictionary -- the diacritical marks had no meaning, the discrimination between the various uses of the word had no meaning (many students considered words to have absolute meanings), the syllables had no meaning."

Given this situation, instead of consigning students to special remedial sections (the usual educational practice) the theory of the project is that students, as one teacher put it, will "read more if they understand and are interested in what they read. . . students (will) speak and write better if they have something to say." A director reports that this theory is working well. A second person, a teacher, reports that students are now more willing to work, but still have difficulties which they need help in overcoming. A third person, another teacher, reports that students are now motivated, and he uses the material to help build vocabulary.

Director E: "The materials, which dealt mainly with the Negro and his place in America were of great interest to the students. This interest alone caused them to read. Once this was achieved, the teachers were then able to point out the level of profundity at which they read and to work on enhancing the comprehensive level of their reading. Such a point in instruction is never achieved in the regular program for the majority of the students find their regular textbooks dull and uninteresting, the complete opposite of the experience in our program."

Teacher F: "I have been reluctant to say that my students have reading difficulties because other members at participating colleges seem to have no students with reading difficulties. They give me the impression that if the students are interested in the material, they will read. The evaluation of the units made by my students show they have been interested in reading selections, yet they say that they have reading difficulties that they would like to overcome. They say (1) that they have difficulty finishing the reading assignments because they have to reread the passages again and again, (2) that they have difficulty getting the meaning of the words from the contexts, (3) that they do not get the author's point until the materials are talked about in class, (4) that they do not know how to attack words so that they can pronounce them in standard English, etc."

Teacher G: "Methods of arousing interest in words and vocabulary improvements were not distinct in themselves but were outgrowths of all of the learning activities undertaken. Every lesson was a vocabulary lesson as students daily came in contact with unfamiliar words and their use.

"When we studied 'An Outpost of Progress,' vocabulary work followed oral discussion. Students, with their individual paperback dictionaries, noted unfamiliar or interesting words and made the necessary notations in their books. They were encouraged to use their newly understood words in their daily conversations and to make a habit of looking up difficult words before attempting to understand or discuss a selection."

In mathematics, the teachers also report that students have difficulties with basic skills. One teacher comments on the demands on his time in this connection. Another teacher comments on how students in the 13-College Program would have been handled in the regular program.

Teacher H: "We had to spend time reviewing the operations with sign numbers when it became necessary to solve problems by the use of algebraic fractions. Students also found difficulty simplifying radical expressions when solving quadratic equations using the quadratic formula."

Teacher I: "Students are placed in remedial mathematics classes (at our institution) depending upon the score they made on the SCAT test administered at the beginning of the year. Fifty-four students in the 13-College Program would have been in the remedial class had they been taking mathematics in the regular program."

Other teachers offer some horror stories of the paucity of the very educational materials in the backgrounds of some of these students. One teacher notes that only two students out of fifty had previously seen a slide rule. Another teacher notes that many of his students had never seen graph paper before or used protractors. A third teacher notes that it is the students from rural backgrounds who have suffered the worst deprivations. A fourth teacher comments on the quality of whatever learning that had been achieved: "they had learned to solve equations by rote and never really understood the principles involved."

Students need practice in the basic skills of mathematics--adding fractions, constructing graphs, solving equations, handling exponents. Again the theory of the project is that the way to get students to undertake the necessary practice is not to put them in special remedial sections, but to get them involved in doing something they want to do and feel compelled to learn. Some teachers report progress along these lines, others report difficulties. One teacher reports the beginnings of success followed by discouragement.

Teacher J: "I want to 'trick' the students into learning more about fractions without using a presentation with which they were already too familiar. Operations on fractions are a major area of weakness. I used a short unit . . . on 'Drawing fractions' in which the students graphed common fractions on coordinate graph paper or on geo-boards. In the habit (by now) of looking for patterns, the students discovered many relationships in drawing fractions. Using rubber bands on geo-boards, a couple of students came up with 'amazing results' when they represented equivalent fractions such as 3/6, 4/8, 5/10, 6/12, etc. These 'amazing results' led to a discussion of similar triangles and 'Measuring Objects.' Virginia Merrill's 'Trig Functions' was excellent for use at this point.

"Student interest remained relatively high during this dis-

discussion until problems of a more rigorous nature were introduced, when they again got that 'lost feeling.'

The same points about deficiencies in educational background were noted by teachers of science and Social Institutions. One teacher of science writes:

Teacher K: "There were no more than four students who showed much previous proficiency in the use of laboratory balances, graduated cylinders, thermometers, microscopes, micrometers, and other metric system weighing and measuring devices."

The discussion of the need for work in basic skills is not to say that some of the students are not very skillful, but to emphasize that many are not. Nor, as another teacher notes, is it any reflection on the native intelligence of the students, but rather the results of their previous experience in the schools. The teaching of skills (including basic skills) is one of the goals of the 13-College Project. The problem for evaluation is: when students do get involved in doing something they want to do, are they also learning the skills necessary to pursue the work further?

3. Learn to Think, Develop Taste and Judgement

The objectives of the project are to involve students so that they pursue their studies because they are interested in them, and in that process are engaged in sufficient activity to gain requisite skills. The objectives also include learning how to think, how to gain and evaluate information -- also through the pursuit of studies that interest the students.

In all subjects studied, teachers report a general reluctance on the part of students to develop an idea through exploring its implications; they just like to go from one idea to the next. One teacher of Social Institutions notes that the situation persists even after the project is well underway. Another teacher of Social Institutions notes the further difficulties posed for the task by his own background as a young white instructor from the North. A teacher of science stresses that because students do not put 2 and 2 together, they often do not even recognize their own lack of understanding.

Teacher A: "Instead of forming their own opinions, some still 'parrot' what others have said, or do not take the time to document their ideas and still deal in generalizations 'off the top of their heads.' Some students still have difficulty in analyzing and interpreting data in order to form valid conclusions -- this is evident in both their oral and written work. If they are challenged with a why, they don't really back up what they say with evidence from other sources or do not understand why the author said a particular thing. Some still show evidence of a speech problem and are still reluctant to participate in class discussion."

Teacher B: "It should also be mentioned that some of the difficulties experienced by the instructor are probably inherent in the instructor himself: a young, inexperienced, Caucasian, radical-liberal, northern graduate student, who was transplanted, and for the first time, into the conservative, impoverished, Deep South, at a "predominantly Negro college." Ironically, there were also many latent advantages to the rather unusual, yet necessary, "mutual adjustments," on the part of both the teacher, and his students. During the first few weeks there were also difficulties without mutually imprecise accents and "lingo," not to mention the "Philadelphian," "Ohioian," "St. Louisian," and "Long Island," accents and idioms. But we all agree that the "Louisianian" was the worst!

"Possibly my worst, and continuing peccadillo, is the unconscious use of terms, jargons, and academic vocabulary words familiar to northern undergraduates, but "foreign" to most Jackson State freshmen. Nor, did I immediately, quite suspect, nor understand, the relative paucity of their reading (including speed and comprehension). Their penchant then for discussing problems and issues vis-a-vis broad, superficial, unconnected cliches or glittering also perplexed and baffled me at first."

Teacher C: "The students have been exposed to many poorly prepared teachers who, in an effort to hide their lack of preparation from their students, are defensive and dogmatic. Their explanations often simply do not make sense. Yet the conscientious student, in a sincere effort to grasp the material, struggles hard and eventually convinces himself that the nonsense is really sense. Time after time I have had students come to me after an exam saying that they thought they understood, and that somehow it just escaped them during the exam. A few questions usually serve to establish that the student actually doesn't understand, and, moreover, doesn't even recognize a state of not understanding. This problem seems to be particularly severe with girls . . . (students) don't spontaneously pursue contradictions and uncertainties in search of deeper understanding."

English teachers noted that when writing about books, students in general tend to write summaries. One teacher writes:

Teacher D: "Not many students (not more than thirty per cent) have reached the point at which they can write themes about literature which do not revert to summary at inopportune sections of the paper. Another significant number of students recognize the need to avoid this kind of weakness when analyzing or interpreting literature, however, they have enjoyed rather limited success in sustained writing in the direction indicated."

Teachers in the various fields describe the objectives in terms of their specific fields. In mathematics, as one teacher put it, the task is "to develop skills in recognizing and generalizing patterns of numerical or geometrical regularity." In literature, the hope is to develop taste through mixing great and not so great literature, high art and popular art, and having students themselves argue in the context of their own experience whether a given work of art lies or tells the truth. In the natural and social sciences, to develop facility in the analysis and interpretation of data. Teachers also state the objective of learning to think in terms applicable to all the fields. The hope is to develop a critical, skeptical, questioning attitude toward all sources of information, whether from authorities, from teachers, or from the printed page. The hope is also, as one teacher put it, to encourage students "to think about topics discussed as they related to their previous experience, their common sense and their intuitions. Much of their previous education lacked reality, it was a kind of magic, a mere verbalism.

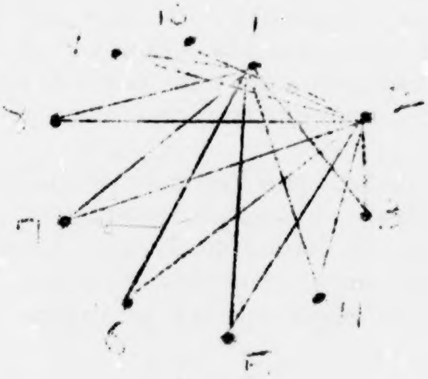
A number of teachers report success in their efforts to create circumstances that provoke the students into thinking. A science teacher describes some questions raised in an open-ended discussion of bogs. A mathematics teacher describes a class conducted by a visitor from the Curriculum Resources Group, in which one of the students, described by the teacher as able but unwilling to put himself out, really gets to work. Another visitor describes how an English teacher leaves students free to raise important questions concerning the action in Antigone.

Teacher E: "Under the unit on Regulation we were studying insectivorous plants. I had made slides of the pitcher plants in the Beckley Bogs of Massachusetts, also in the swamp lands of North Carolina. We were studying the bog ecostat. (The students seem more interested when social problems are related to situations.)

"In Beckley Bogs we had found the remains of a small field animal in a large pitcher plant. It was about the size of a small field mouse. We opened the plant so that I could make a picture of the bones in it. Just as I started to snap the picture someone started sinking between two large clumps of mess. The bog is like quick sand. It was so difficult to free the individual that I forgot the picture.

"I related this incident to the class and showed slides of the other bog plants, and of our collecting fossil pollen from the same bog. The students asked questions and postulated answers for more than twenty minutes: Questions on reactions controlled by hormones and auxins, about sensitive hairs in plants, about defensive actions of plants (prevention of the escape of trapped animals), questions about the bog, how is it formed, the acidity of bogs, the age of bogs, the hazards of studying bogs, bacterial decay in bogs, how fossils were formed in bogs, and suddenly someone asked, 'What would a mouse be doing in a bog? Why would it jump in a pitcher plant?' I gave about ten probabilities and they were still asking why. Finally, I said, 'I do not know.' The students applauded and asked to study some of the other slides at eight O'clock. We had seen a small young bog on the field trip."

Teacher F: (Describing work of visitor from CRG): "The visitor posed the problem: Suppose you had ten points arranged in a circle. How many lines can you draw connecting points? The students merely looked at the teacher, obviously expecting more; the teacher merely walked to the rear of the room. Shortly, most of the students were busy, trying something -- anything! At the head of the first table the student in question had assumed the generalship and assignment jobs of counting to the students at his table. He had drawn a circle of ten dots and numbered them. Then starting from a given point he had the other students drawing



lines from that point to each of the others. For example, point 1 connects with points 2, 3, 4, 5, 6, 7, 8, 9, 10 (9 lines). Then point 2 connects with 3, 4, 5, 6, 7, 8, 9, 10 (8 lines). Continuing this sequence the student made a table:

Point	No. Lines
1	9
2	8
3	7
4	6
5	5
6	4
7	3
8	2
9	1
10	0

Total: 45 lines

The teacher asked, "How do you know that's right?" Without any hesitancy or doubt about the logic of his procedure, the student replied, "Oh, I know it's right!" He did go on to substantiate his answer, however. From there it was easy to do the same kind of theing with a 100-point circle."

Teacher G: (As described by another visitor): "Following a brief summary by one of the students of the genealogy of the characters in Antigone, the class took the form of students asking questions and other students trying to answer them. For example, one student was puzzled why Antigone bothered to cover the body of Polyneices with a thin layer of dust. How, he asked, could this protect her brother's body from birds and dogs and other scavenging animals? A second student immediately pointed out that the act of burial was symbolic, a ritual, and Antigone was observing the ritual. A third student added that the burial had something to do with the religious beliefs of the Greeks. If the belief was honored it did not matter that the burial only consisted in covering the body with dust. (This account is a paraphrase of the students' comments.)

"Students also raised general questions about the play. For example, one student noted that the play dealt with figures that in a sense were larger than life, and he wondered why. A second student asked whether the play was relevant to the contemporary issue of civil disobedience, whether the conflicting demands made on some people today paralleled the conflicting demands made on Antigone. In reply, one student said that in breaking the law, Rap Brown had chosen personal responsibility as higher than the demands of the State. Another student said that in the play he felt that Creon was in the right and that he should have been obeyed."

Considering the objective of fostering thinking as a whole, teachers again find progress slow, but they appear sufficiently well satisfied with the project to continue working. The task now is to examine, in greater detail, how successful this unit or that technique is in provoking students to think.

4. Learn Something Important in Subject Areas Studied

The emphasis in the Thirteen-College Program on getting students involved, and on creating an environment that fosters thinking, is not meant to lessen the attention paid to the substantive matters taught, to what students get involved in and think about. Rather, the emphasis means that, despite the usual claims made by teachers and college bulletins concerning the involvement of students and the fostering of thinking, these goals are in fact not honored in practice. This emphasis also requires a fresh examination of precisely what is important in the subject areas studied, of what is worth knowing, of what things students are to get involved with and think about.

Broadly speaking, in the four subjects offered in the freshman year, the Thirteen-College Program breaks with the traditional assessment of what content is important. In mathematics, the usual freshman course is either a single subject, say, trigonometry or differential calculus, or a selection of "fundamental" topics in, say, algebra and trigonometry. In either case, the chief justification for the inclusion of any topic in the course is that it is a "part of the field." This same rule of selection holds with surprising consistency in all subjects studied. In science, to be sure, the matter is complicated by the presence not only of introductory courses dealing with the "principles" of a field, but also with the choice of fields -- physics, biology, chemistry, and now earth science and space science. In social sciences, with less sure accomplishments on hand, there is an even greater compartmentalization of knowledge and proliferation of disciplines. Instead of the study of man, there is economics, sociology, history, geography, anthropology, political science, and psychology. English is divided into "composition" and literature, one based on learning rules, the other on lists of masterpieces and last year's topical readings. One teacher describes the usual English program this way:

Teacher A: "The first semester of the regular curriculum concentrates on the traditional procedure of teaching grammar and composition through rote learning of rules and routine studying of exercises. The second semester includes some readings in drama, short stories, poems, and essays, along with the writing of compositions, including a library paper. The classes, which in some instances are slightly larger than ours, meet three days weekly. Their textbooks consist of a handbook and a collection of topical readings."

The previous school experience of the students, with the exception of those who attended Upward Bound programs, was of the traditional sort. The amount may have varied. One institution reports that 68 of its 100 students had taken a year of algebra, while another reports that 90 of its students had taken a year of algebra; the first reports that 6 students had taken work in trigonometry, the second that over 20 had taken some trigonometry. But the education offered was of the traditional sort. Further, the teachers report that whatever the credentials offered by the students on paper, much of the education received did not stick. Of course, again, great variations in the abilities and achievements of the students are present, but some general statements are also possible. Teachers of mathematics, from the two institutions cited, discuss the results.

Teacher B: "While these figures seem to indicate that the students in general have fair backgrounds in mathematics, many other factors must be considered in attempting to predict a student's success in a college mathematics course -- such as, for example, what grades did the students earn in these courses? One student related that he took Algebra I four times before finally passing the course with a "D." There is no point in mentioning his attitude toward mathematics."

Teacher C: "However, as impressive as these statistics appear, it became apparent that a large number of the students had just 'suffered through' these courses and had little confidence in their mathematics ability. They 'knew' that mathematic courses consisted of memorizing facts and procedures to pass tests. A significant number of students - some twenty per cent - had difficulty with arithmetic including fractions, percent, and signed numbers."

Similar comments to the effect that students had been taking courses in schools, that the courses were traditional in subject matter, and that the attainment of the students were limited, held for other fields -- again with qualifications about variations from institution to institution and student to student. A biology teacher reports that he has students who believe in spontaneous generation. A Social Institutions teacher reports that students hardly know that two world wars have occurred in this century or that weapons of total destruction now exist. An English teacher finds that students don't apply what they do know, "that students know more formal grammar than they are using in written expression."

One conclusion is that the effort to cover the topics that make up a discipline, and the disciplines that make up knowledge, as is done in traditional educational procedures is not working.

One approach of the Thirteen College Project is to pick fewer topics, but to go into them more thoroughly. One science teacher explains the matter in terms of his own course.

Teacher D: "Since it is virtually impossible to exhaust completely any area of science in depth within a year, this course has as its chief objectives to motivate the student to think profoundly and be able to apply the concepts that are covered to physical phenomena. This is no survey course. Material is selected and presented in such a manner that both the instructor and students find the science course productive, wholesome and exciting. Granted the lecture method covers a larger amount of material, than the inductive approach; but the students do not understand as much from the lecture method, and they do not get involved enough to do extra work on their own."

Another approach of the Thirteen College Project is to pick topics for study and investigation that lie outside those traditionally covered in school and college. One of the program associates in English, of the Curriculum Resources Group, puts the matter in terms of his field, and as it happens, compares Harvard-style education with some projected new style.

Program Associate E: "I have heard it argued many times that if the students in the Program want Harvard-style educations, then that is what we should see to it they get; I have heard it argued that a Harvard education is indeed what they want. The point that we should not, cannot force our desires upon other people is irrefutable, but the "Harvard thesis" needs clarification.

"What precisely is the difference between the education an English major gets now at, for example, Florida A & M and Harvard? Each is equally concerned with the mastery of an arbitrary field of knowledge called "the tradition of letters in the British Isles and a whiff of America." Each would, thus, consider it important, even a duty, for the student to know and respect Wordsworth as the father of the Romantic movement in England. The Harvard student will, before he graduates, own a copy of Wordsworth's Collected Prose and Poetry and will be familiar with what's in it, enough to challenge it, to conduct a dialogue of equals with the poet. The Florida A & M student never reaches the point of partnership with the tradition; he is always learning about it. I attended an upper division course in Literary Criticism. I studied the course outline for the General Education Humanities Course. I talked with and listened to several students discussing their expectations for themselves. And I believe that implicit in the education these young people are getting and pervasive in it is the notion, imposed on them from without, that as black students they can't afford not to know the nomenclature of the white culture. Whether or not they have read The Prelude, or care to, they had better know that Wordsworth wrote it. However veiled, this is education by shaming. I see it in any course syllabus whose author felt impelled to cover therein the entire range of Western civilization, which employs excerpts in order to do so. I hear it whenever there is talk of what "these students need to know." The outline of the General Education Humanities Course reads:

> The writer has observed that many students come to the Humanities course not as well prepared with the basic understanding that they take to the science or social studies courses...some have a "cultural gap" because they have come from underprivileged environments. In view of these circumstances, therefore, it seems both wise and preferable that some background study be given at the beginning of the course to provide maximum benefit to the students.

"Where is the freedom to dismiss Wordsworth entirely?

"Would the Florida A & M students deny their right to this freedom because the Harvard students don't have it?

"Isn't the very existence of this program tacit aknowledgement that our established systems for interpreting and dealing with reality, the "intellectual heritage of Western man," are inadequate, pitifully so, in meeting the demands of present realities, acknowledgement of the need of change?"

One of the innovations in the Thirteen College Program is the introduction of black-related materials, both in English and in Social Institutions -- not in the spirit of familiar Negro uplift efforts, but in terms of the new black assertiveness. There is also utilization of popular art, art by people who do not think of themselves as artists, and other arts besides literary art -- not just painting and sculpture but also film.

The problem of the selection of topics, of content, varies from field to field, and also the kinds of answers offered by the project. In mathematics, emphasis is on a search for physical, or mathematical, or game situations which immediately pose mathematical questions (proofs of possibility or impossibility) and which bear some relationship to current research areas in mathematics. One of the program associates puts the matter this way:

Program Associate F: "We hope to have enough materials that will eventually lead students to some of the most exciting, and accessible, research areas of mathematics, such as topology, probability, number theory, computer programming, abstract algebra, and others. Why shouldn't students be confronted with these most delightful and challenging questions that have plagued mathematicians and have led them to the development of the rich areas of mathematics? For example, students can understand such questions as: Why is it that two cubes never add up to a third cube? Can you construct a path over the Konigsberg bridges? What is randomness?"

In science, following the unsuccessful efforts the first year to develop an interdisciplinary approach, to find topics that dealt with results from a variety of scientific fields, the group decided to provide two half-year courses, one in physical science (including both physics and chemistry), the other in biological science. In physical science, the group decided further to try out a course already developed by another group -- An Approach to Physical Science developed by the PSNS Project. (The initials stand for Physical Science for Non-Scientists, but in the present context this is something of a misnomer. A better title would be Physical Science for Students Who Hate Science -- but who given the right approach might become scientists.) The new course foregoes a survey. Instead it picks one major topic to serve as a plot or story line. Other lesser topics are picked depending upon whether they are necessary in telling that story. A brochure describes the objectives of the Program.

An Approach to Physical Science. "So that students could engage in science in a meaningful way, the PSNS Project restricted the subject matter of the Program. (This) is not a survey course; instead it asks the question: "What is the structure of solid matter?" and shows the students how to find out. This study of one subject provides a focus for topics from the disciplines of chemistry and physics, and allows the course to proceed from simple to increasingly more sophisticated observations and questions. . .

"The study begins with such simple observations as: a crystal grows with surprising regularity, and with faces and angles that repeat themselves; hands are untrustworthy temperature indicators; light passing through a prism is changed into a rainbow.

"The study then moves to more searching observations that lead to questions about more complex ideas: What is diffraction?

What is an atom? an ion? a molecule? How are crystals held together? The students are lead by a smooth and natural progression through such topics as changes of state, what energy is and how one kind of energy differs from another. What bonding is and how one kind of bonding differs from another. The textbook moves from one topic to another only after a 'need to know' has been established."

The selection of topics in biology proceeded in a different fashion. The teachers listed a number of basic areas in their discipline and developed units for them -- the cell, physiology, evolution, heredity and genetics, ecology, and so on. Each teacher decided which topics he would teach and the order in which he would teach them. Of course, there is much overlap in what teachers are doing, but there is also considerable variation.

The study of the social sciences faces the special problem of the phoniness of much instruction in this field -- the avoidance of controversial issues, issues in which the amount of controversy is really a measure of the importance of the topic. Topics to be broached in Social Institutions, as listed by one director, include "urban problems, race-relations, foreign policy, war in Vietnam, problems of affluence." Effort is also underway in Social Institutions to find a unifying theme, a story line, for the topics studied. One suggestion is the notion of modernization, the process by which at different times and in different places, traditional societies have been transformed into modern societies.

Teachers are hopeful about the new objectives, but some are also critical about the degree to which they have been achieved. Mathematics seems to come in most for such comment. Some teachers are critical of the relative balance of goals, of goals of involvement and provoking thought, on the one hand, and the goal of dealing with significant content, on the other. Other teachers are critical of the specific selection of topics chosen for investigation. They find too much emphasis on "interesting" mathematics, and not enough on work that leads to science and technology or medicine or business management.

Teacher G: "The curriculum materials provided too little content. When student interest was gained, the students then desired content and the feeling of mastering some significant mathematics."

Teacher H: "(The units) presented excellent ways of approaching a particular concept, but the units had no depth, i.e.

they did not involve enough mathematical content."

Director I: "In general, the students resented any 'games' approach to teaching. They did not want to be talked down to and needed steady assurance that the material was relevant and would be useful to them. They also expressed concern for the direction of the course during the semester. 'Where is this unit leading us?' and 'How important and relevant is it?' were often heard."

A teacher of Social Institutions makes a similar point.

Teacher J: "Our units 'broke down' precisely when our students were 'just arriving' (mentally speaking). The later units were far too broad and generalized, and they were full of little gimmicks (innocently called "suggestions"), games, and motivational questions. The students were ready for more specifics, more factual data and content."

In the claim to be teaching something important, the emphasis is on the word "something." The project does not claim to be teaching everything worth knowing, or even a selection of things worth knowing from a traditional curriculum, just something worth knowing. In going against established practice, the burden of proof lies on the doer. A task for the project is to clarify what is important about the specific items that make up the new curriculum -- the subject groupings, the specific books read, the films viewed, the experiments performed. This is a task requiring a certain amount of thought. A given item may be important for several very different reasons. Or a given item may be important less for itself, than because it is so useful in leading to a variety of other subjects. The task of analysis also requires experience in the classroom with the item in question, to see whether what is supposed to happen actually happens.

5. Develop Positive Attitudes Toward Self and Learning

The ultimate hope of the Thirteen College Project is not only to foster thinking and provide useful information, but also to affect the attitudes of students, particularly attitudes toward self and towards learning. Teachers seek to involve students in project activities, but success in involvement is not yet a change in attitude. Students must first gain a new sense of themselves and their abilities, a desire for things of the mind and a willingness to work had to satisfy that desire.

Much of higher education consists in playing the game called going to college, acquiring the wherewithall to graduate -- courses, credits, grades. Teachers are just obstacles in the path, to be gotten around. The hope of the project is to make college a place where students are interested in what they study, and so themselves come to supply the power that drives their education.

Seeking to characterize this goal bearing on attitudes, one teacher stresses the need to "convince the student of his ability to reason."' Another person stresses the need "to develop situations for making students more aware of what they really feel and think, and to foster sufficient self-confidence so they will want to express these thoughts and feelings." A third teacher emphasizes the importance of developing "an inquiry-centered classroom in which students use initiative and self-reliance."

Current educational practice, viewed broadly, is not difficult to characterize. There is little room for initiative except along established, official lines. One of the directors reports that students in the regular college program are overly concerned with meeting requirements and getting grades. A teacher, making a similar point, writes:

Teacher A: "When I tried to apply the same teaching techniques to a class of upper-classmen in the regular curriculum that I had been using with the Thirteen-College Curriculum Program students, I encountered immediate hostility. The students in my elective course demanded that I lecture to them only on those parts of the required readings that they would be tested upon."

The fields posing the greatest challenge to any effort to create more positive attitudes, as reported by many teachers, are mathematics and physics. Much of the difficulty is traced to the students' earlier education.

Teacher B: "A third of the class indicated that they did not like mathematics. They said, for example, 'I don't like math because I can't get the feel of it, that is, it seems like an unnecessary chore that is being performed,' or 'I didn't get a good background and it gives me plenty trouble,' or 'I could never really understand what was going on.'"

Teacher C: "These students had very little exposure to chemistry and even less exposure to physics. In no case, had any student looked at these areas in any rigorous fashion. They memorized facts without obtaining any physical appreciation for using them and their mathematical background was very poor, so they generally disliked science or even feared it (especially physics)."

Of course, these are general statements; some students like these subjects, and do very well in them. But it is well known that the percentage of students from the Negro colleges entering scientific, technical, and medical fields is much less than the national average.

The task of determining the success of the project in affecting new attitudes is not easy. It is clear that merely to have students doing assignments is no indication of a new attitude toward themselves and learning. In fact, it can indicate the opposite. One of the Program Associates in English describes such a situation in the response of one class to an assignment.

Program Associate D: "There is an ease, a coordination of insight in the students at this college that I would hate to see dispelled by angry tension. But something unpleasantly sleepy is going on in the minds that produced the following sentences in response to an assignment to write an evaluation of a recent trip to Alabama. The sentences are excerpted from the students' papers:

> The idea of going to Alabama was a bit frightful in the beginning, but in the end it was really a nice, exciting trip. I enjoyed most of it.
>
> I think that our field trip to Alabama was very nice. It was educational as well as entertaining. It was a well-planned trip. There was not a dull moment existing.
>
> I think the tour was both educational and full of enjoyment. I had a rather nice time.
>
> I had a very nice time on my trip to Alabama. There was not anything very exciting but it was pleasant and enjoying.

> The tour was also educational.
>
> Our tour to Alabama was an educational experience that was quite unique in a sense, and as far as I am concerned, some phases of it will remain on the sands of time.
>
> Our trip or tour to Birmingham and Huntsville, Alabama was a learning and enjoyable one.
>
> The trip that we took to Alabama while on the Spring break was quite enjoyable. . . .
> Upon making the trip it was educational as well as relaxing.
>
> Over all the trip was real educational.

"If this assignment was not actively unpleasant for the students, it should have been. In any event it was a waste of their time. What they produced is a parody of the voiceles, pat reporting job they thought was expected of them (parodic because they haven't yet learned how to cover up completely their real voice as it deviates from standard English: "real educational," "pleasant and enjoying," "not a dull moment existing"). Had someone read these compositions aloud to the class no one could have identified the writers, though they all know each other, their style and opinions, very well by now. The papers are not enjoyable to read because there is nothing personal in the writing to respond to as we respond to conversation."

Evaluating the effectiveness of the project in creating new attitudes requires close attention to actual performance in the class. An English teacher writes:

Teacher E: "(After doing a dramatization of "Impulse"), several students remarked that they were surprised to find so much ability in their class, the implication being that they might have more ability, themselves, than they thought."

Determining the effect of the curriculum on attitudes also requires a look at the behavior of students outside the classroom, outside the immediate academic routine. Does the student buy more books and records? Does he lend and borrow books? Is he using the library more? Does he attend extra help sessions? Does he attend special lectures, plays, or films? Does he discuss college work with his classmates outside of class? Does he have plans for intellectual activity during the summer? A number of teachers discuss these more general kinds of behavior.

Teacher F: "The students have been influential in getting the regular freshman students to read much of the material that has been presented. Students have asked how they can get some of the materials."

Teacher G: "Every Saturday morning approximately forty per cent of the students came down to do work of their own interest. The complete reversal in the student attitude toward science, the very sharp increase in dedication and motivation to pursue scientific ventures on their own time verify and demonstrate the effectiveness of the inductive approach to teaching science. Our university is not the only school where this has occurred. Other schools in this program have indicated similar results."

Teacher H: "We had completed the cities unit prior to this (trip to Birmingham and Huntsville) and I heard several students discussing the areas of cities they passed through in terms of what we had studied. An argument started in Dothan, Alabama, as to whether the somewhat run down area surrounding the bus station should be regarded as a slum in transition or a stablized working class residential area. . . .

"(On the way back from African Studies Conference), the three students who attended this conference talked about what they had seen and heard all the way . . . Moreover, on their own volution they made arrangements with the owner of a large bookstore to ship a display of African art to the college for a fall showing."

Teacher I: "Eight of my students who plan to go into science or science-related courses have requested to me to stay in contact with them and send exams or assignments to them during the summer so that they can at least maintain their momentum. All of these students have been given copies of either chemistry and/or physics books to keep and read during the summer vacation."

A teacher of Social Institutions, near the end of the academic year, considered at greater length, the objective of changing attitudes and his own success in achieving this objective.

Teacher J: "Have we achieved what we set out to do? I believe that at the broadest level, we set out to convince young people that there is excitement in the world, that the world can be confronted by the mind, and that books and films often contain the confrontation of others, some of which are important and useful, fun and compelling. These goals are obviously not peculiar to any discipline. I would say, with caution, that most of my students are convinced of that. I would not have said that of more than one or two juniors and seniors in the seven separate courses I taught in the regualr program last year. A couple of dozen of my students became this year, what I'll call for want of a better word, "readers." I say "became" because it is my impression that, with a few very noticeable exceptions, the students did not begin the year as readers, or, as ones who love to read, write, argue, and confront.

"For some reason, in spite of having several much flashier examples at hand, I always seem to think of one girl. She is quiet to the point of speechlessness in class, not very pretty, absolutely dedicated in attendance. In a year of meeting five times a week, she has not missed one day. The first semester she received an incomplete (which meant for us a D or F). We were able to convert the I to a C for the first semester, if the student achieved a C or better in the second semester. In that first semester, she had not written for me five pages of her own work. She copied at every opportunity. Her term paper was worthless. This semester we talked and talked; she worked like a trojan. Every word was hers and it was fairly good quality. She indicated to me that, since she couldn't finish some of the books she was reading on slavery, she was going to get them at the library at home this summer. I firmly believe that she would have gone under in a large discussion section following larger lecture sections with readings prescribed from a 2 1/2 pound Western Civilization book."

Determining degree of success in achieving this last goal is complicated by still other factors. In considering creation of more positive attitudes, it may be necessary to offer at best, partial anwers. One teacher of science writes, "We feel we have achieved partial success in changing some of the students' negative attitudes toward science to positive ones." It may be necessary to distinquish between different kinds of students. A teacher of mathematics writes: "The greatest degree of change seemed to have taken place in those students who had high ability and who really applied themselves." (This, however, seems to beg the question. Why did some students apply themselves and not others?)

At this stage, or perhaps because of individual perspectives, reports differ. One director finds that "the students in our program worked harder, studied more, and read more than the students in the regular program (freshman)." A teacher at another college finds that many students still try to get by with a minimum of work. In evaluation, it may be helpful to look for specific changes in a student's educational plans. Several institutions report that students who hitherto had not considered majoring in mathematics or a science have now decided to do so. It may be necessary to explore the unwanted directions that an effort to move from external discipline to self-discipline can take. One director reports that some students "misinterpret freedom for license." The key point in evaluating the success of the project in achieving this last goal, as in evaluating the project in terms of the other goals, is not to offer speculations about ideal outcomes, but to observe and report what is actually happening.

I. THEMES, OR SUBJECT GROUPINGS, OR STORY LINES

One approach to college education (and to other levels, too) is to view knowledge as already discovered and codified. Education consists in presenting results by lectures, demonstrations, seminars designed to bring out pre-established points, textbooks, and lists of great works.

The approach of the Thirteen College Project is to create an environment in which the student comes to wrestle with problems firsthand, ultimately working in his own way on problems of his own choosing. The theory is that in this way learning becomes more natural (Rousseau's term), the student developing skills and learning to think and acquiring information through pursuing tasks in which he is interested.

In the first approach the procedure is to enlist students in the study of disciplines, covering the various fields of investigation that make up that discipline -- thus in natural science physics, biology, chemistry . . . in English: English literature, American literature, comparative literature, composition . . . in social sciences: geography, anthropology, economics, sociology, government, history . . .

The approach of the Thirteen College Project is through themes that allow for fresh groupings and definitions of what is taught. Mathematics becomes "Quantitative and Analytical Thinking" concerning such themes as "Evolving mathematics from non-mathematical contexts," and "Developing strategies for dealing with puzzles, games, and problems." In science themes are sought which cross several disciplines, thus "The Structure of Matter" involves both physics and chemistry. English becomes "Ideas and Their Expression" concerning such themes as "Alienation" which not only find expression in literature, through such writers as Camus, Wright, and Ellision, but also through art and music, including folk or popular art (the blues) as well as high art. Social sciences becomes the study of pressing social problems, which necessarily draw on a variety of disciplines for their understanding, "Youth and Society," "Cities and Urban Problems," "The Family," and "Vietnam."

The task of evaluation that we are presently considering consists of questions about themes. Are the subjects treated important? Do topics interest students? Do the elements of a unit hang together, or have they, as Dr. Johnson said of the metaphysical poets, "yoked opposites with violence?" Does one theme lead to another? Are the themes, and the units they serve to form, flexible enough, open enough, for use in classes where students vary widely in abilities and in previous educational achievement?

What Makes for Importance, Coherence, Relevance?

The notion of a theme or story line as a basis for grouping together some study activities can apply to one day or a few day's work, or to a semester or a whole year's work. And shorter units may be used to build longer units. Thus, in the course "An Approach to Physical Science," the study of "Crystals" is a unit in studying "The Structure of Matter." Teachers should evaluate both shorter and longer subject groupings and the way they fit together.

In their reports of last year, teachers discuss the effectiveness of different units, a teacher usually offering a comment which is both a judgement on a theme and the materials that served to convey it. There are broad areas of agreement on what they like and do not like, and also differences of opinion, and sometimes just different enthusiasms. In mathematics nearly all teachers who used the G. E. Time-Sharing Computer report that study based on this piece of equipment was the most successful of the year. Among the least favored units was "Shapely Bottles." One teacher is especially enthusiastic about "Computer Programming," "Graphing," and "Probability," and finds least useful, "Shapely Bottles," "Crazy Dice," and "Tossing Thumbtacks." Another teacher especially favors "Computer Programming," "Groups," "Getting Set," "Fibonacci Numbers," and "Pascal's Triangles."

Teachers discuss the units in terms of their effectiveness in reviewing basic mathematical concepts. One teacher writes: "The discussion of 'Modulo Arithmetic' presented an excellent opportunity to review operations on positive and negative integers." Teachers discuss different orders in which to arrange the units and how one theme might lead to another. One teacher reports that he plans to try "Fibonacci Numbers" as a starter next year, that "Getting Set" serves as an excellent follow up for "The Fascination of Numbers," and that "It was through a discussion of fractions in connection with probability that an excellent opportunity arose to use 'Decimal Equivalent of Fractions.'" A number of teachers report that some of the items appeared to students as too childish to merit their interest.

In general, in commenting on the materials, teachers offer but little explanation as to why they found a particular unit successful or unsuccessful. One teacher did begin an explanation as follows:

Teacher A: "In some cases it was difficult to derive meaningful concepts when discussing a particular unit. I would like to refer in particular to the unit on balancing. The students were asked to balance a number of rings and boards containing a given number of holes. The object of the experiment was to derive some mathematical concepts as a result of their activities. However, the students had little perception of specific concepts which could possibly be associated with the experiment and even less hope that the experiment would be effective in guiding them to the discovery of any meaningful concepts. I think that it would have been useful to specify various concepts beforehand which could serve as a guide line."

Parallel considerations hold in other fields. In English certain units command broad, of not universal, allegiance. Most, but not all teachers, for example, liked "Humor and Satire" as a part of "Responsibility."

Teacher B: "After completion of 'Who Am I,' we began the 'Responsibility' unit. The materials and procedures were used as suggested with some supplements. 'Humor and Satire' elicited the expected reactions, numerous requests to hear more recordings of Bill Cosby. In addition, we included recordings of Andy Griffith (Football! It Was," "Hamlet," "Romeo and Juliet"), Bob Newhart, Godfrey Cambridge, Elaine May, and Mike Nichols ("Adultery," "The Telephone," "Mother to Son"). There was a two-fold purpose here: to acquaint the students with the ingredients of humor and the techniques of humorists, and to point out the underlying seriousness of humor leading into the areas of responsibility which this humor touched on. No problems evolved from satire because the essays of Langston Hughes and Harry Golden were explored thoroughly and compared with the humor of Cosby et al and with the humorous writings of the students. Moving into "A Modest Proposal" did not present the problem that some teachers experienced."

In general the teachers of "Ideas and Their Expression," liked the way different topics were grouped into themes, although there were a few negative votes. One teacher finds the material on visual arts good, but also finds it to constitute "more of a break from our reading and writing than an integral part of the unit." And one teacher does offer doubts and cautions about the whole approach.

Teacher C: "Before discussing individual units, it might be wise to mention that the framework of the units -- 'Choice and Temptation,' 'Responsibility' -- were essentially inoperable. To consider these themes as a primary part of class discussion would have involved forcing that discussion in a direction in which it did not intend to go; in addition, it would have done violence to some of the works included. The fact that the themes did break down, however, should not be used as an argument for discarding them. Rather, the greater danger lies in having a format which is so indestructible that we are all inevitably committed to it at the expense of the life and vitality of the class."

A teacher of Social Institutions liked "Civil Rights" the best. Another teacher found "Youth in Society" and "The Family" the best, and the unit on "American Cities and Urban Problems" the poorest. A third teacher reports that the unit on "Revolutions" was particularly difficult to teach. (Was it because the students are expected to generalize about the general course of revolutions, without having yet studied particular revolutions?) A teacher finds that the units are not sufficiently flexible to respond to the kinds of things students get interested in. Another teacher finds an over emphasis on sociology. A teacher recommends beginning the course with "Youth and Society," although he himself was forced to begin with "The Family" because the desired unit had not yet arrived.

Teachers of physical science give widely different reports on certain units, especially "Motion." Details as to what the teachers actually did were minimal, but enough was given to indicate that practices varied so widely from college to college that there really was no unit on motion generally in use. Biology teachers find certain areas of investigation to be of intrinsic interest to students. These are reproduction and, more generally, bodily functions and growth and development; evolution, including genetics and the transmission of traits, and, more generally, chemical evolution, the study of how complex chemical substances evolved into simple forms of life. Evolution, reports one teacher, "evoked a lot of student response, because of its bearing on religion and superstition." One student objected to the study of the theory because it conflicted with his fundamentalist belief, but the other students in his class welcomed the subject.

Students are also interested in the relationship of science to society, in such matters as how society is organized to handle population growth, including the details of birth control. One teacher believes the science curriculum should be organized more than it is "around problems of personal and social significance to young people." Another teacher writes:

Teacher D: "(The need is to --) Develop in students a feel for the role science must assume in problems of pollution, nutrition, disease and humanism at all levels -- individuals, community, national and world . . . Design the curriculum content so as it reveals the role science plays in modern thought and technology."

At this point a more fully developed report on a few selected items concerning the selection and use of units is appropriate.

Cross-Reference in "Quantitative and Analytical Thinking"

Several teachers call for the development of a system of cross references to pull together what they feel to be a certain lack of connection among the units. The materials offer little help in how to proceed from one theme to another. This point is closely related to a second and third point. Some teachers feel that the units themselves did not go deeply enough into subjects. The units are, as one teacher put it, "merely interesting ways of starting a unit." The third point concerns the difficulty of using the units to handle the variety of students in the program, students with different abilities and different previous educational achievements. The essential need, one teacher finds, was to develop material sufficiently in depth "to challenge those students coming to college with three or four years of good high school mathematics."

In the reports for the academic year 1967-68, two teachers discuss these issues in detail. Work towards developing a system of cross-references was begun during the 1968 Summer Conference, and described in the report for that conference.

Teacher E: "It seems to me that the units prepared and submitted are not so much units as they are isolated topics that could be organized into comprehensive units. I think that we in the writing group were dimly aware of this situation even as we presented the topics but that we never came to grips with an organizational pattern. We made stabs at correction both at Pine Manor and at the Atlanta Conferences during the 1967-68 academic year but the efforts never came to fruition. If, for example, I could have had a series of comprehensive units with a list of cross references of topics developed at the writing conference that might contribute to the development of each unit, I believe that my teaching would have been much more effective. What really happened is that as I introduced a given unit (topic) I tried to keep myself alert to possible directions in which the discussion might go and have ready additional materials to supplement the unit. This procedure was the original intent, but not actually having such materials well in advance made the process a trial and error one.

"I do not suggest that every teacher in the program have identical comprehensive units but that each one have a set of units which he feels will be adequate for his own school community together with cross references for supporting material. An example will help.

"Early in the first quarter in one class, I used coordinate tic-tac-toe to introduce and/or review concepts involved in the cartesian plane. The discussion led to playing around with numbers (the 1 to 20 counting game with variations), strategies of winning, the real number set, figurate numbers, repeating decimals, modulo arithmetic. I had thought that the tic-tac-toe game would lead rather quickly into functions and graphs, but it didn't happen that way. At the beginning of the second quarter we found ourselves again confronting the cartesian plane; we did the unit on motion, "Two Students' Walk," and developed such discussions as the absolute function, the greatest integer function and their graphs, various ways to solve simultaneous linear equations in two and three unknowns; we even got into third order determinants which some of the students handled very well. When we did the "Two Students' Walk" experiment, I honestly had not the slightest idea how much in-depth discussion we would do on functions and graphs even though the idea of the unit was to get some involvement in graphing. Although a desirable aspect of the program is not knowing beforehand which direction a given topic will take, I should think it even more desirable if the teacher could have readily available the possible directions that it can take. Cross references for "Two Students' Walks" might include:

Motion (velocity, direction, displacement)
Vectors
Analytic geometry (slope of a line, forms of the equation of a straight line)
Algebra (solution of simultaneous equations)

Perhaps the job of making cross references is going to lie in actually trying out a topic to see what will develop from it and then thinking about what areas it might conceivably lead into."

Teacher F: "Some students had a previous knowledge of the particular topic under consideration; this seemed to destroy the effect of the approach on other students who were not familiar with the particular topic; since unfamiliar terminology was used and there was a strong tendency toward the direct formulation rather than the discovery approach. As a result, others felt that the discovery approach not only yielded inaccurate results but also took more time than was necessary.

"In some cases, it was difficult to determine the proper starting of discussion. It is possible that the objective was not clearly stated in the unit or no apparent starting point was indicated. I might also point out that these units did not fit well into the pattern of discussion at any point during the entire course.

"It would be desirable to extend many of the units to much greater depth than would be possibly indicated by a single concept. This could be quite beneficial to students interested in pursuing the concept to the greatest possible extent and would also allow for a clearer insight on applications. This takes into consideration the fact that other courses may succeed this course which depends on a detailed knowledge of concepts discussed in this course. However, it is apparent that this would require more meeting hours for the entire class if the amount of content is to remain the same."

1968 Summer Conference: "As a result of the committee's work, a complete cross reference system for math units was developed. The committee extracted from the staff and the teachers a list of mathematics topics that we felt should be included in our first year course. They then categorized the math units written in the summer of 1967 and during the school year 1967-68, according to the aforementioned topics. While the committee was doing this they informed staff and teachers of gaps to give us an idea of some areas that people should be working in. At present we at CRG are completing work on a cross reference system for the units written this summer."

A question for evaluation is how well is the system of cross-referencing working out? Is something comparable needed in the other curriculum areas?

Integration in the Physical and Biological Sciences

Another topic calling for special comment is the effort undertaken during the first year of the program to integrate the fields of physics, biology, and chemistry on the basis of what were taken to be a group of pervasive themes. Many teachers, and the program associates at CRG, found that things did not work out as hoped, and the decision was made to adopt a modified approach.

What went wrong? One teacher expresses the hopes of this approach. A second teacher notes the difficulties of getting the physical, biological , and chemical treatments of a concept like energy in phase. A third teacher reports that the arrangement of the units did not allow for systematic progression from simpler to more sophisticated work.

Teacher G: "Examples from the physical sciences are used to illustrate biological concepts and reciprocally, biological models or examples are used to illustrate physical science principles. . .

"Contributions from the physical scientist to the topics, The Nature of Science, Matter, Energy and Motion, and Waves were to lay the foundation of concepts and principles which the biologist could use in his consideration of the life sciences."

Teacher H: "The problem lies in the fact that when the physical scientist generally covers a concept like energy he would have already discussed in intimate details other dependent concepts such as velocity, acceleration and force quantitatively before even considering energy, because he would use those concepts to define energy mathematically. The biological scientist would on the other hand consider energy in a qualitative fashion and use it without any concern for rigorous development. Therefore, by the time the physical scientist is ready for a discussion of energy, the biological scientist has already covered it."

Teacher I: "Early experiments must be straightforward, insensitive to details of technique, and require little repetition. Gradually we work up to more sophisticated experiments, where technique becomes critical. Repetition and careful attention to detail then become a natural and necessary part of the experimental process, and the student is not faced with them before seeing their significance."

The training and outlook of the teachers and the way college departments of science are organized pose other difficulties. Teachers do not feel competent to teach outside of their fields. One director says, "The science division of the university opposed the concept from the beginning and did little to encourage it or promote its success." In practice, the project really offered two courses, each with its own instructor, one in physical science and one in biological science. There was very little interaction between them, although in some cases students were shifted back and forth between the two classes, every few weeks and with poor results.

It is interesting that several teachers still feel that such an interdisciplinary course moving as needed into any field is still a great idea, but that the magnitude of the undertaking both conceptually and in overcoming present teaching practices was simply beyond the means of the Thirteen College Project. After all, the high school science curriculum development projects, running for a number of years each, and costing millions of dollars, were still conceived in terms of standard disciplines, as the names indicate -- The Physical Science Study Committee Physics Course, The Biological Sciences Curriculum Study, and The CHEM Study. Dissatisfaction with the first year's efforts at integrating subject matter is not unanimous, or rather a number of teachers, at least in their written reports, make no mention of difficulties encountered in trying to achieve this objective. But a reading of their own descriptions of what they are doing discloses that they may be offering, as one teacher says of himself, "a good traditional science course, geared heavily toward biological science, with the customary pre-arranged labs."

For the present academic year, 1968-69, a steering committe for science decided to provide two half-year courses, one in physical science (including both physics and chemistry) and the other in biological science. In physical science, the committee adopted a course already developed by another group -- An Approach to Physical Science developed by the PSNS Project. In biological science, the teachers, each for himself, selected from among the more successful units used last year. They also sought, on the one hand, the inclusion of original scientific papers in the course and, on the other hand, a closer combination of the laboratory and the written word to avoid a presentation that is overly abstract.

One question for evaluation is how does the second year's program compare with the first year. A second question is how does the approach undertaken in the physical sciences compare with that in the biological sciences.

Black-Related Studies

An important aspect of the Thirteen-College Project is the introduction of black-related studies in "Social Institutions" and "Ideas and Their Expression." The subject is approached not as another exercise in Negro uplift but as related to the new black assertiveness. But the approach is to develop this particular theme as a part of other themes -- Camus deals with alienation as does Eldridge Cleaver, the history of civil rights is a part of American history -- rather than develop a separate bloc of Afro-American materials.

Teachers agree on the need for black-related studies, the question is how much. In "Social Institutions," several teachers report great student interest. The students want more black history, more on race relations, more on Africa, more on civil rights, more on minority (and majority) problems. In some cases the curriculum results directly in students studying themselves, studying events they know about first hand but events whose causes they did not previously seek to understand. One teacher finds

J. Newfield's The Prophetic Minority, although very difficult reading for the students, particularly helpful in this regard.

Teacher J: "Much of Newfield's book is written about events in rural Mississippi, sometimes their hometowns, and about things they 'knew' but had never put together in an organized perspective. That some were now beginning to ask very significant, elaborate and well-posed Social Science questions, became obvious and gratifying -- since a 'good question' is frequently as meaningful as a 'good answer.'"

Some teachers find the emphasis too heavy, students became bored or tired, or teachers find the program too one-sided, as one teacher put it, "too much talk about current black feelings, tones and response." A second teacher finds that "Negro history, particularly between 1865 and 1958 is not interesting to the students per se." Students see no point to history, perhaps as the result of their school experience, and it must be made relevant.

In "Ideas and Their Expression," teachers also report great interest in black-related studies, although again raising the question of how much. They also report the effort by students to relate what they read to their own experiences.

Teacher K: "About half my students are a self-sufficient, autonomous group who enjoy doing anything that reflects them and their ideas. This was particularly true where racial issues were involved although some of them complained about reading so much material by or about Negroes. Students liked controversial issues."

Teacher L: "One student noted parallels between his experience in a rural area and Douglass' experiences during slavery. The wife of the farmer-owner of a large tenant farm had aided in this student's early education, but the farmer had objected strenuously. Another student from Mississippi pointed out similarities between episodes in her life and Richard Wright's. Two students saw exact opposites to their experiences and those of Ralph Ellison, while some students agreed and others disagreed with Baldwin's major stance."

At several colleges, notably Talladega and Lincoln, students initiated their own news and literary publications. It is interesting to note that students are interested in contemporary themes and the new black assertiveness is among them. Items published include a reprint of H. Rap Brown's "A letter from prison to my black brothers and sisters;" a discussion of the merits of integration versus segregation, the latter viewed in terms of its advantages to promoting black consciousness and political skill; and much fiction, verse, and fantasy devoted to race relations.

Questions for evaluation include -- how effective are the black studies? How do they fit in with the other topics taught? Is there too much stuff? too little? Is it possible to provide this emphasis without allowing a black jingoism to replace a white jingoism?

Connections Between Courses

The freshman year in the project is divided into four courses-with different instructors, different rooms, different materials, different hours. In these different courses the things the student is studying bear certain relationships to each other. Indeed, just as the project in each course seeks out ways to connect separate fields of investigation, so the project in the freshman year as a whole is searching out ways to establish connections among the courses themselves.

Teachers report different ways in which they have brought courses together and different degrees of success in this endeavor. Teachers of "Social Institutions" report that some of the works read in "Ideas and Their Expression," such as The Brig, provided illustrative materials or problems for analysis for the general concepts under study. (Indeed, some of the more literary or journalistic works, such as Manchild in the Promise Land, included in "Social Institutions" were there just for this purpose.) And, conversely, teachers of "Ideas and Their Expression" report that insights gained in "Social Institutions" can be useful in understanding some of the works they are reading. One teacher remarks on the use of the study of folkways and mores in "Social Institutions" in helping his students understand the action in the short story "The Lottery." Another remarks on the help his class received in reading Siddhartha from the coincidence that at the same time the class in "Social Institutions" was doing materials on identity.

A similar relationship of mutual utility holds between science and "Quantitative and Analytical Thinking." A few teachers stress the possibility of mathematics drawing its problems from an analysis of the physical phenomenon studied in science (work in graphing is, perhaps a case in point), and the duty of the mathematics teacher to cover topics needed in the science course (a science teacher reports that before he turned to genetics, the mathematics teacher had provided "an understanding of probability, ratios, and binomial expansion.") In general, however, the feeling is that such possibilities have been neglected, and the project has missed out on natural ways of demonstrating the relevance of mathematics. Two teachers discuss these points.

Teacher M: "The mathematics curriculum has been unnecessarily independent of work in other disciplines . . . I should have scheduled my topics on 'Scientific Notation,' 'Two Students Walk,' and 'The Slide Rule' to coordinate better with physics."

Teacher N: "Instead of beginning with the unit originally scheduled to start the year, the mathematics classes began with logarithms, coordinated geometry, the trigonometry of the right triangle, and the use of science laboratories and classes. This situation produced clear and perhaps unexpected dividends. For the first several weeks, the students were given an unmistakeable and unforced demonstration of 'relevance'."

A special problem is posed by those matters in English that fall under the general heading of "basic skills" -- from competency at spelling to knowing how to organize a paper effectively. A few teachers in other fields feel that they should contribute to such instruction, that the full brunt of the effort should not be born by the teachers of "Ideas and Their Expression." One teacher of "Social Institutions" even complains, "The units as a whole give little or no consideration to the development of the student's writing skills. To some extent an exception here may be 'Youth and Society'." One the other hand, one director simply despairs of ever gaining the cooperation of teachers of other subjects in teaching writing skills, and so, because of the importance of the subject, advocates increasing the hours devoted to "Ideas and Their Expression" and reducing those devoted to some other subjects. Regarding another group of basic skills, those in mathematics, a few science teachers think that in the future they should work more closely with mathematics teachers in helping students make up deficiencies.

In their reports of the 1967-68 academic year, some teachers discuss new possibilities for establishing connections between courses. Several teachers see possibilities in using the computer introduced in "Quantitative and Analytical Thinking" to work problems posed in "Social Institutions." Several teachers note possibilities of using the connections between evolution and social Darwinism to relate biology to "Social Institutions," and they note the more general need to relate the study of science to the study of its impact on society.

In sum, teachers report on various forms of coordination among the courses. The general feeling is, however, that so far there has not been as much work along these lines as there should be. Why? In part, teachers are reluctant to do work outside their own fields. In part, there have been a lot of other things to do. Questions for evaluation concern how much coordination exists among the four courses and whether more effort should be expended on this goal.

II. WRITTEN MATERIALS

The basic materials of the curriculum consist of novels, plays, short stories, critical essays, poems, historical studies, social analyses, statistical surveys, tapes, films, laboratory experiments, and so on. These also must be evaluated item by item for their effectveness in achieving the goals of the project. The themes and story lines serve to group together the materials in various ways, but we must also evaluate the actual works of literature and other materials to be read and studied. Is it to be this play or that play? this translation or that translation? this experiment or that experiment?

The approach of the project based on the learner as doer, not as the passive recipient of knowledge, is reflected in the very manner of printing and binding of materials selected. In the more accustomed approach to education in these colleges and a lot of other places, the basic materials are textbooks, surveys, and anthologies. Everything is already judged and set in order by someone else and put together in units of such weight that students are not likely to carry materials around for reading and study at odd moments. There is "The Great Works of Literature" (in three volumes) for English, "The Development of Mankind" for social sciences, the book on "Foundations" for mathematics, and the book on "Fundamental Concepts" for science. The Thirteen-College Project emphasizes putting real books and real reading matter in students' hands -- paperbacks, scholarly journals, magazines, and newspapers. The project also includes appropriate reference works and some of the teachers have compiled materials consisting of the students' own work.

The present section is limited to a consideration of written materials and such related matters as the office equipment necessary for reproducing special materials for the course, the space necessary for students to read, study, and talk, and the logistics of supplies. The next section considers other media, such as film, tapes, laboratory experiments, and the equipment and space necessary for these enterprises.

The Importance of Paperbacks

The use by the students of what is in effect a small library of paperbacks, instead of a few textbooks and anthologies, has important pedagogical implications. In the ordinary course of their lives, these students are not furnished with models of book buying, book owning, and book reading. They come from homes without books and go to colleges with bookstores which are that in name only. The books provided in the curriculum can be the beginnings of the students' own libraries. Moreover, a collection of books, as opposed to a textbook or anthology, implies by its very existence more choice for students and teachers in determining what to read and how to read it. You can drop some works from the library and add others.

One of the program associates, on reporting a visit to one of the campus bookstores, developed these ideas more fully.

Program Associate A: "I scouted around the college bookstore, which is smaller than this office. There is a small revolving rack of paperbacks, such as one sees in neighborhood drugstores; from the dust on them I'd guess not one is sold a month. The required course books are almost without exception expensive hard-cover textbooks. I looked over the English texts to see what an English major would be reading, which turned out to be the predictable selections from the predictable classics, packaged in anti-aesthetic ten-pound bundles. One advanced course was using the book Four Great American Novels, which for $6.95 gives the student the complete texts of the Scarlet Letter, Billy Budd, Huck Finn, and Daisy Miller, all of which (with Turn of the Screw thrown in) can be purchased in your choice of paperback editions with psychedelic covers for a total of $1.85.

"How is it that, at a time when even dungaree manufacturers make their back pockets broader to accomodate the paper-back, this college is still depriving students of its joys? Damned if anyone would ever take Four Great American Novels along on a picnic - picnic basket weighs enough as it is. And who is perpetuating the attitude implicit in this scene, that these four novels ought to be read not as pleasure but as duty; whose the crime?

"Holt, Rinehart & Winston is implicated for its discriminatory profit-seeking; no major publishing house would dare pawn off that collection at such an exorbitant price on any Ivy League school. They search out a market, perhaps, that "won't know any better." (Indeed these students won't, for the bookstore doesn't own a copy of Books in Print, and there is no procedure for ordering books not in stock. The nearest decent bookstore is halfway across town, right by a white university.) The teachers who order this book and all others like it, year after year, are implicated; they really should know better and I'd be afraid to see revealed the assumptions behind their choice of books to teach. In this hoax, only those who can least afford to pay through the nose, the students who are robbed of the opportunity for inexpensive self-education simply by being denied its availability."

What Makes for Accessibility?

Selection of books and other reading matter for the curriculum is not simply a question of picking books dealing with the topics you want to approach. It is also a question of picking books that are readable, accessible to these students. Readability, in turn, is not simply a matter of "reading levels," of selecting books of appropriate vocabulary and sentence length. It is also a matter of clarity, of liveliness of style, of use of suspense in developing points, of success in connecting to old interests or awakening new interests. Anyone can guess at what books students will like and find accessible, but the idea of the project is that you can also try things out. The notion of readability is also an experimental question, and need not to be carried out in terms of mechanical notions of "easy" reading. There can be both pleasant surprises and disappointments.

A teacher of "Ideas and Their Expression" and then a teacher of "Social Institutions" report on their experience with certain books. A third teacher lodges a complaint about the reading program in "Social Institutions" as a whole. There is just too much to read.

Teacher B: "Contrary to my expectations, Siddhartha was very popular with the students. At this time they were involved in a unit on self-identification in "Social Institutions," and they used their vocabulary from that class to discuss Siddhartha's search for himself.

"Both classes decided that they would like to tape a performance of The Brig. They read the play individually, rehearsed, and then taped. They also spent a period listening to the tapes. I had thought that they might become bored with the play with so much exposure, but this did not happen. When we discussed the topics suggested by the unit on The Brig it seemed to me that by becoming involved in the play they came closer to an understanding of the issues involved.

"One of the biggest surprises I had was in the students' response to Go Tell It On The Mountain. They definitely did not like it. This may have been because they had just read Manchild in "Social Institutions," or perhaps the fact that I cannot believe in John's conversion weakened my presentation. At any rate I would not teach it again. I think perhaps some of Baldwin's essays might be more profitable.

"The units on word order and punctuation, the Brooks poems, and "We Real Cool" exercise were ineffective; it is my theory that this is because they were the last things discussed in the first semester, and the students and I both were thinking of exams and grades. If I were to deal with these units again, I would like to try them earlier in the year. . .

"The time devoted to a study of 'Antigone' was, I felt, extremely profitable. Where the students had failed to identify with Anne Frank or Baldwin's John, they seemed to have a great deal of empathy for Antigone. I had hoped to have some disapproval of her actions, but all seemed to think she acted wisely. In connection with the Hip-vs-Square language unit, some of the students rewrote portions of the play in hip language, but this did not work out as well as I had hoped. They enjoyed the hiptionary and explaining to me what the words meant, but felt rewriting the portions in 'Antigone' was artificial. They also felt the selections from the CRG unit were out of date. . .

"Conrad's style in Outpost of Progress was a stumbling block for a lot of them, and a surprising number did not even know what had happened in the story after they had finished reading it. . .

"The success of the Chambers article (Earnest Chambers in Ebony) -- and the article from the Times on the murder ('Thirty-Eight Who Saw Murder,' which describes the murder of a young woman in New York) -- has caused me to think that perhaps more time should be devoted to reading really contemporary material. I plan to check with Harpers and Atlantic Monthly and next year use one of them in the classroom. I discovered that the students could read and enjoy Ginzberg and Ferlinghetti, and I would like to see more modern poetry included in the units."

Teacher C: "Goodman's book (Growing up Absurd) was pretty much of a failure. It was inaccessible in a way I hadn't predicted. Listen to a typical page as I jump from line to line through it:

> As an heir of the French Revolution, Karl Marx kept much of this concept. . . During the course of the Nineteenth Century, however, 'human nature' came to be associated with conservative and even reactionary politics. The later romantics were historical-minded.

This is not meaningful to most entering freshmen. I let their frustration and boredom guide me, and stopped with Goodman approximately half-way through the book. Even less allusive chapters provoked little response. I've not yet put my finger on reasons why."

Teacher D: "The reading level of the student is not given enough consideration. There is entirely too much reading. This is true of all the units and it is especially true in the unit on Urban Affairs."

Of course, reports on what works and does not work differ from teacher to teacher, and sometimes the matter can hang on such matters as when in the course of the year the work was introduced. But in gaining the responses of a number of teachers, overall patterns do emerge. For example, not just one, but a number of teachers report their doubts about using Herman Hesse's novel Siddhartha and find, contrary to their expectations, that it awakens enthusiastic response among their students. Several teachers hazard some suggestions to why. It deals with a search for the self, for meaning in life, a perennial problem of adolescence, and it serves to introduce students to another culture. In "Social Institutions," a number of teachers report that students were fascinated by materials dealing with other cultures. Reports favoring Siddhartha were not unanimous, nor were reports that students like to study foreign cultures. Indeed, some teachers report that Siddhartha was rejected just on that score. One teacher writes that students do not like the book "because its setting was in India and centered around Eastern religious concepts." Another teacher writes, "The students had no background of Indian culture. They contended that they need to study more about their own race in these times rather than waste time on another culture."

The reason offered by one of the CRG program associates for including Siddhartha in the curriculum is also of interest. He does not believe it a particularly great book, something in the same line of effort as Somerset Magham's The Razor's Edge, but he does believe that it would intrigue students. They would read it willingly and so approach closer to that style of life where one buys and reads books and thinks about ideas. The reason for suspecting that students would like the book was the growing popularity of Hesse among Ivy League students. Of course, there has subsequently been a revival of interest in Hesse in literary and academic circles.

The same concern for readability, understood as something more than mechanical notions of vocabularly level, apply to the selections of reading materials for science. Of the PSSC physics course, teachers report they can work with the laboratory manual and the laboratory equipment, but the textbook is unnecessarily inaccessible. One teacher writes, "The text requires a vast amount of reading to understand a concept. The laboratory guide was adequate." Another says, "The PSSC text is logically organized, the writing careful and consistent, but it is not clearly written in simple, direct prose. Fundamental ideas are not set off from masses of explanation and exposition, so separation of primary and subordinate ideas is difficult."

Logistics and the Literary Environment

Concern with the written word goes beyond printed materials -- paperbacks, hard covers, magazines, newspapers. The project develops its own guides, prepares its own selections of literature, and distributes samples of students' work to students and faculty in a given college and to other colleges. To reproduce these materials the project makes use of a variety of kinds of office equipment -- typewriters, ditto machines, binders, mimeograph machines, Xerox machines. This use goes beyond that usually associated with lower division work in colleges. There was little reporting the first year of the program on the effectiveness of different pieces of equipment, or equipment needs as a whole, but it would be helpful to start acquiring such information this year.

Reports on the effectiveness of the procurement and distribution of supplies are also in order. The colleges are not set up to handle the logistics of such a wide variety of materials, and much of the time of the directors and CRG program associates must be devoted to this effort. To the task simply of budgeting for, ordering, and storing supplies is sometimes added the task of bucking present procurement procedures. Teachers report many instances of having to make do when things did not arrive on time. One teacher relates he had to begin the unit with "Who Am I?" because "Choice and Temptation" did not arrive on time. (It came six weeks later). Another teacher says he could not introduce the unit "A Piece of String," with the film, because the film was not available. Several teachers suggest that the teachers themselves be given a certain amount of pocket money to spend as needed on their own initiative. A teacher requests more information on where to buy film. With the great emphasis in the project on having on hand a wide variety of materials loosely organized, it will be helpful to learn how well logistics are being handled this second year.

A few colleges established a special study and browsing room for students for use in all fields.

Teacher E: "Our project maintained a special browsing area for students. The area was furnished with attractive, comfortable, easy chairs (as well as other types), bookcases with sections for each discipline, and study tables. The room was open regularly from 8:30 a.m. to 5:00 p.m. and often beyond that hour. Two of the four faculty members maintained offices near the browsing area. A small group of project students made regular use of the area for study and browsing. Very few students in the regular program made use of the area."

As noted earlier, students at several colleges initiated their own news and literary publications. A director describes one publication as follows:

Director F: "The chief special project was the Thirteen-College Curriculum Program News, a newspaper which published five times this year. This served the students as an opportunity for self expression, creative writing, controversial discussion and learning lessons of discipline, responsibility and taste in public statements. It served the entire campus in that it stimulated the regularly authorized student publication to action after one year and a half of inactivity."

A director also describes another publication, noting that the students used duplicating equipment and workspace provided by the project.

Director G: "A development worth noting is the conception and execution of a modest "Free Press" that was organized by half a dozen students from the program. These students recruited selections of writing, besides writing their own, and they carried through the whole process of editing, duplicating, and distributing various issues of their work."

Very little analysis is offered of the first project, and none of the second, although a quick reading of some of the issues of the "Free Press" shows a concern with racial strife, the war between the sexes, and a fondness for dirty words. Where a project has provided special reading or working facilities for students it will be helpful to have some account of what happened and what the gains were from the effort.

Original Scientific Papers

A special note is appropriate at this point about an innovation in the teaching of biological science introduced in the project during the 1968 Summer Conference. In place of the textbook, teachers decided to use original scientific papers as the central reading material. Working with several scientists from Brandeis University, the teachers examined classical and current biological and biochemical literature to find suitable scientific papers -- papers that students, with the help of teachers, can understand. Students, so the theory ran, by studying the first reports of new findings, would see more clearly how scientific discoveries are made and how they are connected to the supporting data. By the close of the summer the teachers had papers by the dozens to choose from, grouped in sequences bearing on such topics as hemoglobin, vision, muscle,and nerve physiology, and the biology, biochemistry, and genetics of the coliphages.

One of the program associates at CRG gives some background on previous use of original scientific papers in education:

"The study of original papers is common in upperclass or graduate seminars, where students have acquired basic background and where classes are relatively small. However, their use with freshmen is not usual although some biology courses at lower levels use them. In the BSCS text for a second biology course at the secondary school level, the reading of original papers is encouraged as a supplementary activity by students."

The task for evaluation is, how well does this approach work in the context of our program? How apt are the particular papers chosen? Which worked well and which poorly? One of the key ideas of the Thirteen-College Project is to enable students to learn directly from nature. How well does the use of original papers fit in with the notion of students gaining first-hand experience in the laboratory? Can the approach through original papers be integrated with laboratory work?

III. AUDIO, VISUAL, AND LABORATORY MATERIALS, AND FIELD TRIPS

Students in the project work not only with the written word in various forms, but also with a variety of other media. The concern is not only with plays, novels, essays, poems, research studies articles, as published in books, magazines, journals, and newspapers, but also with films, tapes, records, slides, film strips as displayed by film projectors, tape recorders, record players, and overhead projectors. This concern with "stuff," in addition to the written word, is still broader. Science includes laboratory kits, supplies, equipment, and facilities. "Social Institutions" includes the street corner from which street corner research is conducted, and transportation to that street corner. "Quantitative and Analytical Thinking" includes calculating devices and games. "Ideas and Their Expression" includes attendance at live performances and films at commercial movie houses.

The Importance of "Stuff"

There is much talk these days about the use of multiple media in education, but something less in the way of actual activities, and much of this work is still in the style of education as the purveying of selected and pre-digested information. The hope of the project is to explore the possibilities for education of other media, of "stuff" generally, but to do so in a way that further enables students to work with materials, with phenomena, with the world, first hand, rather than have it all sorted out beforehand and demonstrated to him.

Teachers report that in general they and the students were pleased with the emphasis in the program on the use of other media. The need is to get still more materials and to learn how to use them more effectively. One English teacher notes how a happy coincidence brought together a variety of listening and viewing experiences. A second English teacher describes how a particular record helped make a subject come alive. The record, a modern version of the classic drama under discussion, came from the teacher's own collection.

Teacher A: "The coincidence of cultural enrichment added to the unit on Antigone, for the students attended a Greek film of that drama as well as a fine mounting of Phaedra performed by the Touring Classics Company at the State University nearby. My classes also alertly followed their texts as they listened to a new Theatre Recording Society performance of Antigone (T.R.S. 320)."

Teacher B: "One of the more effective sections of the Responsibility unit was "Language and Speech-Drama," especially the Oedipus Cycle. The students read "Opedipus Rex" and "Oedipus at Colonnus" and discussed them. When the discussions began to lag and the writing seemed uninspired, there was some concern. Comparisons with present day situations and parellels with the students' experiences did not evoke the reactions that were evident during the discussion of "The Caucasian Chalk Circle." The designated chapters in Edith Hamilton's Mythology were reviewed with a comparison to Christian mythology and a recounting of some of the myths and superstitions existent in the Negro race. Some positive reactions were noted, but there was still too much reticence. Then I remembered a recording of Jean Cocteau's "The Infernal Machine," which was in my record library. The next day at the laboratory session of fifty students, the first act of the recording was played and discussed. The atmosphere changed. On subsequent days the remainder of the Cocteau work was played. Reactions were gratifying. The romanticism of Cocteau's treatment, the youthfulness of Oedipus and the Sphinx, the unrequited love of the Sphinx for Oedipus, the tenderness of Jocasta, the protectiveness of Teiresias and many other factors seemed to dispel the lethargy. When discussions and writings began on "Antigone," all went very well."

The films, recordings, live performances, and other audio and visual materials used in the various courses of the curriculum require the same evaluation as the written materials. In improving the curriculum it is necessary to know for the particular items, what was instructive and meaningful for students (the film, "Dead Birds," for example, was cited by nearly all teachers of "Social Institutions" as successful), and what fell flat -- and why, for either outcome. Of particular value is the consideration of the special advantages gained from working with audio, visual, and laboratory materials. Thus, in the teaching of science, one teacher notes the importance of film strips as supplementary guides in working with students, so instruction is not initially so dependent on reading. Regarding guides in dissecting fetal pig and beef hearts, he writes, "The clear, visualized procedures were especially helpful to students who have difficulty in reading and comprehending written directions." Another teacher puts special emphasis on the need to make science more concrete, via a better and more quantitative laboratory, and through greater use of physical models and visual materials. A third teacher sees greater opportunities for independent study through the use of films, film loops, tapes, and equipment kits.

How to conduct field trips is also a matter about which experience can be gained and shared -- trips to theatres, concerts, lectures, conferences, to other libraries, to other places to gather first hand data for projects for "Social Institutions." The director at one college reports that they first undertook trips with the entire group to places chosen by the faculty (some colleges report chartering buses for such purposes) but that this did not work out satisfactorily. They then decided to provide students with a variety of choices, to be undertaken on a smaller scale, and urged students to propose their own trips. The faculty reports that this worked out better.

Director C: "After these two trips (off the campus to professional performances of 'The Brig' and 'The Merchant of Venice' each involving the entire group), the staff decided to modify its approach to field trips away from the campus. None of the staff seemed happy with a plan which required all students to go on a particular trip. Several reasons led to their decision not to require subsequent trips. First, those who were required against their will to go created a morale problem for the entire group. Second, taking a group of approximately one hundred gave trips something of the atmosphere of a grade school trip to the zoo, and this atmosphere negated some of the effect of maturity and dignity that the staff was trying to create.

"From the first of January on, the staff tried a different plan. Students were offered a variety of options by way of trips and out-of-class activities, and students were even urged to propose their own ideas about places to go. Students themselves selected members of the group to represent them in week-long exchanges with other colleges. Students also selected those who attended a writers' conference at Fisk . . .

"One group took an overnight trip to New York, where they attended a United Nations debate on the Middle East crisis and they also visited Columbia and Harlem during the time of the student uprising. Stimulated by discussions of the Russian Revolution, a busload of the class went to a showing of the film "Dr. Zhivago." Instructors took carloads of students on a number of occasions to a large city public library for research in their term paper projects." . . .

"Students and staff all felt that the second approach was far more successful and far more educationally rewarding than herding the entire group into a bus for a required trip. Besides, the students had a greater sense of participation when they were not only permitted to choose an activity but also to help plan it. In some respects these student-planned trips were among the most successful undertakings of the entire year."

Tape Recorders

The project is exploring new uses of special items of equipment, such as tape recorders and computers, and these items are of sufficient importance to call for special discussion. The problem for the project is to learn how to use such instruments, not as a part of a system of authoritarian education (the teacher talks into the tape recorder and the student listens, perhaps at greater convenience than in the classroom or lecture hall), but as part of a system based on students grappling with the world and ideas first hand (the student does some of the talking into the machine).

Teachers report using the tape recorder in connection with other activities in a variety of ways. One English teacher notes the use of the tape recorder in helping students understand the meaning of a play. Another English teacher notes its use in helping involve remote students, in a unit on humor.

Teacher D: "Both classes decided that they would like to tape a performance of The Brig. They read the play individually, rehearsed, then taped. They also spent a period listening to the tapes. I had thought that they might become bored with the play with so much exposure, but this did not happen. When we discussed the topics suggested by the unit on The Brig it seemed to me that by becoming involved in the play they came closer to an understanding of the issues involved."

Teacher E: ". . . I still faced the problem of involving my less vocal students in discussions. The solution, the tape recorder, was brought in. Anecdotes were presented orally and taped in and out of class sessions. Excellent discussions centered around the language, tone, phrasing, use of pauses and other devices necessary for producing humor."

A third teacher also notes the successful use of the tape recorder in connection with the writing of satire and other forms of humor, the students making tapes of what they wrote. The teacher says, "Not only did the students write very interesting humorous tales, but they also made recordings that amused others who were not in the class." A fourth teacher reports the general effectiveness of student taping presentations to be played in class, either alone or with partners, doing dramatic scenes, reading letters, interpreting poems, or reading essays. This proved both enjoyable and instructive and it had bearing on speaking and listening skills. The teacher mentions as of special merit the opportunity provided the student making the tape to participate himself as a member of the audience, to hear how he sounded and what he had to say from that perspective.

It will be useful to learn what use is being made of the tape recorders the second year. Are they useful for work in other classes, for example, for work in "Social Institutions" in conducting interviews? One teacher raises the question of how best to circulate tapes among the participating colleges, for use both by students and teachers.

Computers

The mathematics curriculum puts great emphasis on getting something concrete into the hands of students -- something beyond the usual chalk and board, compasses and slide rules -- as aids to intuition, to abstract thought, to a sense of the connections to reality of what they are doing. And so a considerable amount of paraphernalia is employed in the program -- from attribute blocks to batteries and switches, from graph boards to various games, such as nim. It will be helpful to acquire information as to which pieces of equipment are particularly effective, and which are less successful.

Of the various pieces of equipment used in the first year, the one that proved the most successful, the teachers who used it are agreed, was the G. E. Time Sharing Computer. It was introduced during the last few months of the program, in many but not all of the colleges. One reason this particular computer was chosen is that the language it employs, BASIC, is quickly learned.

The use of computers in education is often associated these days with something called computer-assisted instruction, in which the computer is often programmed to teach something else, such as reading. Such efforts are usually education in the mode of purveying information, especially in the form of drill. The Thirteen-College Project on the other hand, is using computers to teach mathematics, and something about computers and programming, through enabling students to do mathematics with computers, exploiting the special things that computers make possible.

One of the teachers describes the response of his class to the computer and some of the work they did.

Teacher F: "By general student consensus the G. E. Time-Sharing Computer was the most valuable and successful instructional device and topic. The students came to appreciate the computer as a powerful tool which was very useful and desirable. They overcame their awe of this "complex machine," and many became quite comfortable interacting with it.

"One student rose from an obscure position in his class to become an expert in computer programming. He appeared regularly each afternoon and worked late with the computer. Early in his experience he spent ten to fifteen minutes debugging a simple program error which the computer refused to accept. His innocent error was to use the algebraic form 2A for a product instead of 2*A, the acceptable form. However, he worked with the machine and studied the two computer handbooks until he became an expert. With ease he wrote programs to print out solutions to many types of calculating problems and sequences of numbers with special characteristics. Finally, he became involved with the difficult task of programming the game of Tic-Tac-Toe. Although he never completed a perfect program, he had a very workable program for most of the moves that a player might choose in competing with the computer.

"Each student had "hands on" teletype experiences as he ran exercise programs. He learned discipline and attention to detail. Misspelling, a misplaced comma or improper language caused the computer to respond with such statements as "improper formula in line 20," "improper variable in line 50," or "FOR statement without NEXT." Class discussion developed a program for the quadratic formula. Students then developed original programs to print out computational exercises, tables of functional values, and special sequences of integers including the Fibonacci numbers."

One teacher who did not get a G. E. computer was able to gain use of another kind of computer locally available, and used it at the start of the year. He notes several advantages to the use of a computer.

Teacher G: "I started off the year with the computer for several reasons: we had a big old Burrough 205 at the time, and I thought that it would get the year off to a good psychological start by doing something that the students had never done before, something they would be proud to write home about. I think this worked out very well. Further, our computer did not have a working compiler, which meant that the students had to do all programming in machine language (which was relatively simple on this machine). This was a sneaky way of reviewing a lot of the fundamentals of high school math (removing parenthesis, signed numbers, etc.) without appearing to do so, since the students had to be able to perform these operations correctly before they could tell the machine how to do it."

The teacher at another of the colleges that did not get to use the G. E. computer also reports success with another device, an electronic calculator with four simultaneous consoles (Wang Laboratories 320/SE Calculator). Students use it both to do class work and to fool around with on their own.

Teachers offer brief summaries as to why the computer appealed to students, but it would be helpful this second year to have some more thoughts on this question. Several teachers touched on the point that it gave the students a feeling of getting ahead of students in the regular program, of getting something fancier and more advanced. One teacher writes: students "said it made them think and boosted their ego since they 'were getting something the other kids were not.'" Another teacher wrote:

Teacher H: "The use of the computer was the really big thing in the program. Junior and senior math majors in the regular program were seeking out our freshman computer specialists for "know-how" in computer programming. Staff members from the regular program came to discover the mysteries of the computer as well as to find out what made our program tick."

The reasons for success with computers need further exploration because of its implications for the rest of the project, if indeed this success is repeated the second year. Is it because the use of the computer, so much the symbol of our times, is also a symbol to the students that the education afforded through this means is authentic? Is it because of the patience of the computer with student mistakes and the immediate response to student efforts it provides?

Street Corners

The educational approach of enabling students to grapple first hand with the world and with ideas about the world also finds its counterpart in "Social Institutions." Although not a central part of the program as it was developed during the 1967 Summer Conference, reports back from the colleges show that a number of teachers did attempt to find ways to involve students in original investigations, gathering their own raw data, not out of books, but in the field.

Students work singly or in small groups. The kind of investigations, and the resulting reports, could take the form of statistical studies. They could also take the form of more intuitive social analysis, and even the form of the better journalism one finds in magazines like Atlantic, and Fortune.

A sense of the nature of possibilities this approach can be gained by noting the variety of topics undertaken by students in the program on one campus, and then quoting the opening and closing paragraphs from one of the resulting reports. The teacher describes the project as follows:

Teacher I: "During the second semester the students were divided into four committees in each section in order to undertake a field research project. The students voted on the subjects for investigation and I tried to assign each student to the committee of his choice. These topics were:

Marijuana Smoking

Pre-marital Sex

Comparison of Thirteen-College Program and Regular Freshman

Cigarette Smoking

Attitudes on Vietnam

A Community Study(of Hopson City, Alabama, an all-Negro Community)

White Teachers at Talladega College

"They used whatever techniques that were appropriate, questionnaires, interviews, and observation. When we analyzed their data, I presented some material on statistics. This is an area which could be expanded as it can serve to tie together mathematics and biology (genetics) as well as social science.

"This type of learning experience has probably been the most valuable for the students as it has provided them with first-hand experience in acting out the role of a social scientist. Once the students realized that it was up to them to decide what and how to study, the more interested ones began to really think about social science rather than think about passing a social science course."

The community study of Hopson City, carried out by a group of seven students, is particularly interesting. The scope and ambition of the work is indicated by the opening paragraphs.

"We, the Community Group, selected Hopson City to do research on because we were informed that it was a totally independent Black City. Based on this information, we were interested in finding out whether or not Hopson City really is totally independent.

"In order to find out to what extent Hopson City is independent, we investigated such areas as the government, the educational system, business establishment and the people of Hopson City.

"In investigating these areas, we hoped to answer the following questions:

a) Who runs the government
b) Where Hopson City is located
c) The population of the city
d) Who operates the business
e) The school system
f) What a typical day is in Hopson City
g) General appearance of the city and the people
h) Various types of recreation
i) The various religious affiliations
j) Jobs and income
k) General atmosphere of the people

"We collected the data presented in this report by the following techniques: (a) Interviews, (b) Observations, and (c) Active participation."

The paper concludes:

"The people of Hopson City consider themselves as being independent for two basic reasons: 1) Only Black people are residents there and 2) They have their own Black Mayor and Councilmen. However, we consider independence as meaning no outside aid or influence by Whites. We conclude, therefore, that Hopson City, from our research data, is not a totally independent Black City. The city receives financial aid from Federal and O.E.O. funds, the school is operated by the county, mail is delivered from Anniston, the people of Hopson City who work outside the city are employed on White jobs, and 98% of the people's shopping is done in White stores in Anniston and Oxford.

"We further conclude that the survival of Hopson City is chiefly dependent upon white influence of Anniston and Oxford."

Questions for evaluation include, how much effort in "Social Institutions" should be devoted to street corner research? What kinds of undertakings have proved most successful?

Laboratories

The notion of students grappling first-hand with physical phenomena, with concrete things, finds its most familiar model in science. Indeed, the tendency, when stressing the working-with-things aspect of any discipline, is to draw comparisons to science, thus we have "language laboratories." (If in our culture, art were fundamental instead of science, we might be calling such places "language studios.")

Many of the colleges offer separate courses in science for non-majors and for majors. The courses for non-majors often offer no laboratory at all, while the courses for majors often offer what one of the teachers called a "cookbook" laboratory. A teacher describes the situation in his institution:

Teacher J: "There is no laboratory given with this course for non-majors. . . the limitation is due to a large number of students per class (one hundred or more), limitations of physical facilities to accomodate smaller classes, and shortage of instructional staff--all of which can be attributed to insufficient funds which seem to be prevalent throughout the various departments of the University....

"Although the first course for biology majors in the regular program includes more hours, laboratories, and smaller classes, it is still self-defeating in that many students complete requirements lacking problem solving abilities."

The hope of the Thirteen-College Program is to provide a laboratory that is not devoted merely to the demonstration of truths already arrived at but helps students find things out for themselves. Open-ended experiments can be performed. The belief underlying this approach is that students will gain a more accurate picture of what science is like -- a picture not just of the finished results, but of how knowledge is won. Students will also come through their own experience to understand the role of evidence and hypothesis in scientific thinking and gain skills in the use of equipment.

In reporting on the work of the first year, some of the teachers developed these notions more fully -- the hopes of the project and some of its pitfalls and possible excesses. Here are the comments of two teachers:

Teacher K: "Elementary topics are treated rather like research problems; in this way, the student experiences the 'scientific method' directly. The usual listing of "principles of the scientific method" is totally inadequate; there is no substitute for direct experience if one is to learn how reproducibility and consistency are used to separate fact from artifact. The student learns how easily mistakes are made. He learns how to check the results of one experimental approach against another and how to use his results to judge his techniques and improve them.

"When detailed instructions aren't given, students make mistakes. This is good; they discuss their results, detect their mistakes, revise their procedures, and repeat the experiment. This process may be repeated many times, just as the scientist repeats his work many times with minor modifications in the course of his research before he finds the optimum procedure.

"In our enthusiasm for the power of the scientific method and our fascination with its results, we often forget that real science - the actual process of research - is laborious, painstaking, and repetitious. It requires patience and careful attention to detail. Scientists are nitpickers, and very few students are naturally inclined in this direction."

Teacher L: "The premise on which we built our course material at Pine Manor last summer is grounded in giving the student an opportunity to discover science for himself. The arguments he discovers for himself are better understood and remembered than those he gets from others. This seems to be in line with the principle which Rousseau developed in his book Emile, viz., let the students learn from nature, not from what others have said about nature; let the student go directly to the facts, to things, which alone are incorruptible. This principle seems very appropriate in teaching science when all achievement takes place in the form of discoveries. However, "self discovery" as I see it does not mean that the student is to discover all of science for himself, or even any appreciable part of it. Science is a vast accumulation of the discoveries of many men. It must be transmitted from one generation to another in the form of charts, books, experiments, research. A great deal of chemistry must be taught. I think we raise a serious obstacle to teaching when we suggest to the student that it is beneath his dignity to learn what someone else already knows. The amount of science to be taught, and the amount left for rediscovery depends on the time and energy of teacher and student."

The first teacher endorses the objectives of the laboratory, but he does not find that the actual work lives up to the program's hopes. The concepts used to analyze phenomena do not arise naturally from the data. He cites the work with the roller-skate cart in the study of motion as an example, and recommends the use of the air-track to make honestly and readily accessible the idea that an object will continue to move forever unless it is stopped by an outside force. He criticizes some of the work in the biology curriculum on the same grounds.

Teacher K: "The curriculum in biology adopted at the Pine Manor Conference is essentially a survey of conventional biology, albeit from the modern "molecular" point of view. "Explanations" for biological phenomena is sought in concepts such as molecular structure, hydrogen bonding, equilibrium, pH, energy, and so on. The biological phenomena are demonstrated by experimentation. Unfortuantely, however, the concepts necessary for the explanation and interpretation do not arise naturally from the biological experiments, but were originally suggested and developed from an altogether different and very extensive body of physical and chemical data. There is not time to explore this mass of evidence in detail, so the concepts are introduced 'on faith,' and their validity is never demonstrated experimentally."

A third teacher agrees that the program possessed fundamental weaknesses in its efforts to develop honest experiments and open-ended experiments. He does believe, however, that he was able to devise materials and procedures on his own -- an effort made possible through the time and encouragement afforded by the project -- that did work and hence that did succeed in demonstrating the superiority of a laboratory in which real investigative work was possible. He writes:

Teacher M: "Our approach was laboratory oriented where the students discussed various concepts in detail and carried out activities applying these concepts to explain various physical phenomena. (Mathematical concepts were stressed only where they were absolutely necessary in order to keep the students from getting bogged down here. For example, graphing and graphical analyses were used wherever possible in place of trigonometry.) No attempt was made to avoid the painstaking, intricate steps that scientists encounter in their study of various systems. The philosophy here is that students cannot obtain an appreciation for the scientific method or understand the process by which conclusions are drawn unless they get their hands dirty in the laboratory. Emphasis was placed upon verifying everything that was covered or discussed. The experiments and activities were approached open-endedly. The students could pursue any one activity or experiment into any number of avenues according to their own interests."

Some of the teachers in the program appear to have taught good, if more traditional, courses. The laboratory was more in the form of demonstrations of knowledge obtained from other, more extensive, sources, rather than an experience from which "interpretations arise naturally."

It is important to know just what kind of experiments teachers are making available in the laboratories -- perhaps several kinds --

and how well things are going. Last year one of the biology teachers wrote concerning "A study of primitive cells -- bacteria," and comparing it to other experimental work:

Teacher N: "The lack of success here proved typical of microscopic examination, in general for the entire year when viewing non-motile, sessile organisms. However, on examing active specimen, interest and production were high. (Examples - Daphnia, pond water, planaria, etc.) The validity of the latter statement is reflected in the intensity of independent work undertaken by the students. In general, the more active larger specimen, capable of manual manipulation, generated more enthusiasm."

But in general, not much comment is offered on just what kinds of phenomena, kits, supplies, equipment are readily accessible to students and lend themselves to more open-ended experiments. Even this account does not offer much detail. This year major changes were introduced both in the physical sciences and biological sciences. It will be interesting to learn how this year's work compares with last year's, and how the two courses compare.

Supplies, Equipment, Facilities

If the curriculum is to rely more heavily on certain kinds of audio, visual and laboratory materials, than the curriculum in the regular college, then obtaining the necessary materials is also part of our task. A number of teachers the first year report difficulties in getting supplies on time. A teacher of biology writes that the "use of microscopes was hindered because our microscopes had not arrived and we had to borrow from the biology department." Another science teacher writes, "Very few experiments were done to illustrate chemical reactions for two reasons.
(1) The chemistry glassware and hardware kits had not arrived.
(2) The room provided for science lab was not suitable for reacting chemicals that required a ready source of water." Other kinds of troubles also intervene. A mathematics teacher notes that a local telephone workers' strike prevented installation of the typewriter that goes with the computer. A teacher of "Social Institutions" noted "difficulties in locating and then paying for our social science film series."

Of course, the science laboratory is not only a matter of obtaining specific items of equipment, but having access to a suitable laboratory facility, with work benches, sources of water and power, and so on. Some teachers report that they were extremely fortunate in the laboratory facilities put at their disposal by college authorities. Others, however, report difficulties in obtaining good facilities.

Teacher O: "We began the year with severe deficiencies in facilities; these conditions have gradually been rectified, and now we are in good shape. Adequate storage space has been secured and shelves built. A classroom for classwork has been made available; our standard freshman chemistry laboratory is totally inadequate for classroom discussion. All faculty members now have desks, and offices are in a centralized location. There is a room available in which the students can congregate and resource materials and books can be displayed.

"Unfortunately, our laboratory is not for the exclusive use of the program, which means that everything must be put away at the close of each class. This had definitely discouraged students from pursuing problems on their own initiative in their extra time.

"The importance of the physical arrangements cannot be overemphasized. We have been quite disappointed that students have not displayed much initiative in pursuing things on their own. I believe that this is at least partly due to the fact that there was no place available at the beginning of the year where students could congregate informally, where newspapers, magazines, and books were handy, and where additional lab work was easy and natural."

As with the logistics of written materials, it will be helpful to learn how well the procurement and distribution of audio, visual, and laboratory materials is being handled this second year, and whether the colleges are making available the necessary rooms and other facilities.

IV. TEACHING PRACTICES AND TECHNIQUES

The educational ideas of the project are carried not only by the themes or subject-groupings chosen; the books, plays, and articles read; the films viewed, tapes heard, and laboratory apparatus employed; but also by the teaching practices and techniques employed. The present section, as in previous sections, reports on some of the items in this category but not all. And teachers are urged to read all the items developed, even those developed in terms of disciplines other than their own.

Catalyst and Exemplar

The traditional role of the teacher in many colleges is to be the authority. He stands up in front of the class and explains things. He is the purveyor of a fixed body of information. He paces the students, telling them what to learn and when to learn it, and then tests them to insure that the schedule is followed. To protect his position of authority, he sticks to his field of specialization. He does not stray to neighboring disciplines or to more general questions of how to grow up sensible.

The Thirteen-College Project views the teacher differently. It views him as also a learner. He is supposed to know something, but not everything, but he is also supposed to be curious about things and to know how to find things out. The questions he explores are determined not only by his own professional concerns, but also by things on the minds of his students. He seeks to create an environment in which the students bring up points and discuss matters on their own initiative. He watches what students are doing and listens to what they are saying, and finds this material to be a fine source for educational tasks. A teacher of "Ideas and Their Expression" writes that the teacher "is less an instructor and more of a mediator or better still a catalyst in class discussion." A teacher of physical science writes: "A good teacher in our program is one who knows when to speak and when to keep silent."

A few of the teachers and directors stress the role of the teachers as models of behavior, as exemplars. If students are to work hard, to develop intellectual integrity, then so must the teachers. (In its most elemental form, intellectual integrity for a teacher means reading the books he assigns, which -- alas -- some have not always done. A program associate at CRG must also possess intellectual integrity, which in its most elemental form means reading the books he suggests for the course and which -- again alas -- some have not always done.) Regarding teachers as exemplars, one of the directors writes:

Director A: "One of the most interesting developments in our program, over the year, was the observed effects upon student academic characteristics resulting from exposure to certain faculty characteristics. Some observations were: Students worked harder in areas where the faculty members exerted a great deal of effort. Students used the library more as a result of increased use of the library by the faculty. Students showed interest in exploring and learning new areas if their teachers showed an interest in exploring and learning new areas. Students performed at higher levels if their teacher expected them to. (Case in point, quantitative treatment of data)."

Teachers comment on increased, and more aggressive, participation by students in classroom discussions. A teacher of physical science writes, "The approach has erased forever from the minds of our students that myth of not challenging their teachers." Two teachers of "Social Institutions" make the same point:

Teacher B: "Many students who otherwise would have remained quiet in the classroom have begun to realize a new confidence in themselves and have begun to recite in class, knowing that what they might say would not be torn apart by ridicule."

Teacher C: "It would appear that the students in our project are more highly motivated and are more willing to participate in class and extra-class discussions than other students in the regular program. (Example: At a recent seminar on "Riot Behavior" which was sponsored by the Department of Sociology, the students from my class asked more questions or demonstrated a willingness to speak with much greater frequency than other students."

Another teacher of "Social Institutions," quotes a student on the same point:

Teacher D: (quoting a student) "In a way you could say we have freedom of speech because that's exactly what we do. If we don't agree on something then we let everyone know we don't and why we don't. Students in the regular freshman program have told me when they enter some of their classes they are prepared to sit back an hour and listen to a lecture without saying anything whether they agree or disagree. Some of their teachers go strictly by what's printed in the textbook."

A few teachers offer testimony as to what happened to themselves as a consequence of the program, or what did not happen to themselves. Some were not moved. A teacher of "Social Institutions" reports, "I found the 'discovery' method the least effective teaching approach. Undoubtedly, one contributing factor lending itself to the failure of this approach is my own lack of familiarity with it and my lack of confidence in it." But other teachers report either a change of heart or a strengthening of previous liberal convictions. An English teacher reports, "The ISE approach to teaching in a new curriculum proved challenging and stimulating to a teacher who was an avowed traditionalist. There is no doubt now that presenting literature as an expression of an idea rather than a type or form is the better way to involve students." Another experienced English teacher writes, "I am convinced that my students made more meaningful progress in all aspects of communication than any freshman I have ever taught." And still another writes, "The program has caused me to reassess my teaching philosophy and techniques and to realize that today's students must be allowed creative dissent." A teacher of physical science writes:

Teacher E: "This is no survey course. Material is covered in depth. Timely material is selected and presented in such a manner that both the instructor and students find the science course productive, wholesome, and exciting. This is in contrast to my teaching experience using the lecture method. I have covered a large body of scientific material using all sorts of beautiful analogies and mathematical proofs that generate that 'I understand look' from the student -- only to find, to my dismay, that the students generally grasped very little of this material."

A few teachers also testify that they became more aware than previously of their students as individuals, and that more opportunity for expression in class lead to a closer relationship between students and faculty outside of the ordinary academic routine. An English teacher stresses the importance for this aspect of manageable teaching loads.

Teacher F: "The reduced student load has made it possible for me to become 'friends' with my students and to invite them to my home where discussions are held in a different atmosphere. It was impossible for me to arrange group meetings for the 170 to 200 students taught each quarter in the regular program. Therefore, some of the students thought that the students in the regular program who were invited to my home were the preferred ones."

Questions for evaluation include, what effect has the project had on the teacher's own outlook? Has he learned better how to work with student initiative and dissent? Does he think that trying to do so is worthwhile, or is it a mistaken endeavor?

Dramatizations

The notion of the teacher as talking less and listening more is a general proposition about education. It is also necessary to consider the details -- the new activities for students and the new ways for teachers to work with students doing these activities. The project finds that the standard curriculum even in English is too bookish -- too much about books and not enought about ideas and about life. Why do teachers assign book reports and library papers? To get students to read, to think about what they are reading, to write, and to enable the teacher to judge, through reading the reports and papers, whether the students have done the work and what they have learned. But these same purposes can be accomplished by other means, means perhaps more natural and certainly of greater variety. Dramatizations of literary selections is one group of such activities. The staging of a dramatic performance, even if only for one's classmates, is also an occasion to think about, write about, talk about the selection. The teacher again gets the opportunity to judge, this time through seeing the performance, how much work the students have done and what they have learned.

To be sure, the reason for introducing dramatizations into "English" is something more than finding new ways to do the same thing. It is also to do additional things, to get closer to literary experience. For much of literature -- stories, plays, poems -- are meant to be spoken and listened to, rather than read silently to oneself.

The teachers to a person report enthusiasm for dramatizations. They begin by noting the students' willingness to perform before their classmates and willingness to watch the efforts of others. One teacher writes, "These students have a deep sensitivity to words and a latent desire to perform before groups -- to create something of their own, in their own way." Another teacher notes that the problem is not willingness to perform, but performing at the expense of thinking. "The classes enjoyed dramatizing scenes from 'A Piece of String,' but I had the feeling that this was because they like to 'ham it up' in front of the rest of the class, and that the story itself did not have much meaning for them."

Dramatizations are of different types. There are first straight-forward performances of works written for the theatre. Students study, rehearse, and then perform scenes from various plays. Teachers report that Antigone, The Brig, and The Caucasion Chalk Circle are particularly popular. Teachers stressed both developing the meaning of the play and good speech. One teacher writes, "Emphasis was placed on correct understanding of lines, pronounciation, tone, and interpretation."

Considerable emphasis is also placed on another form of dramatization, Chamber Theatre. Instead of working with a play, students translated a passage from a short story or novel into dramatic form and read it. This was done mainly by distinquishing the various characters and points of view in the passage and then assigning appropriate sections to different actors. A character may possess more than one point of view and hence be represented by more than one actor. The author may also have a point of view and hence be represented by a separate actor. The need to make such assignments and justify them to fellow students focused the student's attention on the problem of point of view in narration. One teacher writes:

Teacher G: "The most effective sections were those dealing with the Chamber Theatre dramatizations. After finishing the suggested assignment on the short story 'Impulse,' they became very enthusiastic and wanted to do another Chamber Theatre assignment. We read Faulkner's 'Barn Burning' which was not assigned; they found a passage there they wanted to dramatize and they did a rather creative piece of work. Each class was divided into five groups, and each group worked out its own dramatization. This created a great deal of wholesome rivalry. It also gave them experience in the two communication skills they are weakest in: oral and verbal expression. This was a more "painless" method of working on these problems. They enjoyed criticizing others and were good sports about being criticized."

Dramatizations took still other forms. Students wrote dramatizations of courtroom scenes. A number of teachers report success with the staging of the trial of Michael Lowes, in "Impulse." One teacher writes that this required research "to find the current courtroom procedures, the penalties for felonies like that of Michael Lowes, the writing of subpoenas, the selection of juries, etc."

Students wrote original plays. These often showed the influence both in content and style of other recent readings, of events then unfolding in the world, and of T.V.

Some of the teachers of "Social Institutions" also made use of classroom dramatizations, specifically in the form of role playing. One teacher reports:

Teacher H: "The students had become very interested in Black Power by this time, so I organized a colloquium entitled "Which Way the Negro American" (or something to that effect). Six students were chosen to play the parts of Stokely Carmichael, H. Rap Brown, Martin Luther King, a member of the Black Bourgeoisie (such as Dr. Bledsoe from Invisible Man), Roy Wilkins, and Booker T. Washington. This was very successful as the students were given an opportunity to apply the viewpoints of spokesman whose opinions they had read. I would suggest that more programs of this nature be organized for the material in the different units."

It would be useful to have some detailed accounts of how dramatizations were actually used in specific classrooms and what students learned. In the freer assignments it would be valuable to report what topics and stylistic devices appealed to students.

Parody, Hip vs. Square, Publication, etc.

The development of assignments to promote reading, writing, thinking, and talking took other forms as well, some of which were used in conjunction with dramatizations and others of which proceeded independently.

An objective of the curriculum is to teach a variety of writing, reading and speaking skills -- spelling, agreement of parts of speech, pronounciation, use of dictionary, organization of ideas, recognition of main ideas, phrasing, developing a point of view, grammar and mechanics, argumentation, vocabulary, and so on. Many teachers report that students hate to write. The theory of the approach is that you best learn these skills, by writing and so the task is to find tasks that students will willingly undertake.

Students wrote parodies and satires, looking both to contemporary (Bill Cosby) and classic (Swift) models, and taking their subject matter from fundamental things (the Bible). Most teachers found this approach to work well. One teacher writes:

Teacher I: "The unit on Responsibility was introduced with the Bill Cosby record. After listening to the Cosby selections the students wrote their own humorous dialogue. First, they wrote a continuation of the Noah dialogue; then they selected another Biblical story and treated it in a humorous fashion. No reluctance was in evidence concerning the humorous treatment of Biblical material."

(It is worth remembering that Elizabethan Drama itself arose in the 14th and 15th Centuries out of a kind of folk theatre, dealing in tragedy and also comedy. These early works were performed not in play houses, which had yet to be invented, but on simple stages. The story of Noah was a popular theme. As G.B. Harrison notes, the figure of Mrs. Noah, on the ark, with all the inconveniences attendant upon being cooped up for forty days with a host of miscellaneous guests, was fruitful field of humor. The character of the shrew developed out of this circumstance.)

Students also wrote parodies and satires on contemporary themes. A teacher reports that students wrote, performed, rewrote, and then performed before several audiences, "a skit framed on Huntley-Brinkley which produced hilarity and some satire on race and Vietnam."

Another type of assignment was the writing of hip versions of passages from plays and novels. Since hip language is often ironic, this work had a certain connection with satire. (In "He bad," for example, the word "bad" does not mean bad, because a "bad" person from a white person's point of view might be something else from a black person's point of view.) More broadly, the notion behind writing hip versions was, as one teacher puts it, "If a student could correctly break a word down into this language, then he fully understood the message that the author was attempting to convey." Many teachers report success, but approval is not universal. One teacher writes:

Teacher J: "In connection with the Hip-vs.-Square language unit, some of the students rewrote portions of the play in hip language, but this did not work as well as I had hoped. They enjoyed the hiptionary and explaining to me what the words mean, but felt rewriting the portions in "Antigone" was artificial. They also felt the selections from the CRG unit were out of date."

Writing assignments took a variety of additional forms. One teacher lists some of the different approaches he tried:

Teacher K: "We approached 'impulse' by letting the students read a portion of the story and then write their own endings. . .

"[As part of an interest in German concentration camps that followed the reading of The Diary of Anne Frank,] the students were able to see the Theatre Atlanta production of The Investigation. They wrote diaries as if they were in nuclear fall-out shelters. . .

"I was impressed that the students were able to grasp the central ideas in the Socrates and Thoreau selections. They wrote dialogues between Socrates and Thoreau which demonstrated that they were aware of the positions of the two men. . .

"After the discussion of man's choice in his own life, we turned to a discussion of just how much choice man has in interfering in other people's lives. I had copies made of the New York

Times article 'Thirty-Eight Who Saw Murder,' an article which describes the murder of a young woman in New York -- a murder witnessed by thirty-eight people who, for various reasons, did not report the stabing. The students then wrote an interior monologue -- selection one of the people mentioned in the article and setting down what the thoughts of that person could have been at the moment of the murder."

Teachers discuss a number of other techniques employed in getting students to write. One teacher reports that she got a good discussion going on a book "and at the height of the discussion, students were asked to write. Each wrote his personal descriptions of the characters and cited supporting pages, lines, and passages." But another teacher says, "It was very interesting at this point to note that some of the students who had the strongest arguments (orally) found it most difficult to put these ideas down on paper." This teacher also found it helpful to grade separately on ideas and on mechanics: "I had several students who had good ideas come back and ask for help in written expression, but not all students." Several teachers found it helpful to have students work first with tape recorders. (Executives and even CRG personnel are not above using recorders and dictaphones.)

A nice account, told over the course of a year, of how a special type of writing problem can lead naturally to a concern for the mechanics of writing -- spelling, punctuation, grammar -- can be taken from another project, the Teachers and Writers Collaborative, of New York City, working in elementary and secondary schools. This concerns the use of "publication," of duplicating and distributing the student's own work, as a motivating device, a device used also in the Thirteen-College Project. A publication of the Teachers and Writers Collaborative describes the approach.

"Both writers and teachers felt it was important to type up and "print" the children's work, in either mimeographed or hexographed form. Seeing their work in print affirmed for the children the validity and importance of their own thoughts, feelings and words, and inspired them to write more and more and more. They also, when confronted with the printed page, became more aware of spelling mistakes and more interested in spelling correctly. In this connection the following excerpts from writer's diaries give a sense of what happened during the year:

> "(October 21, 1967). . . I had to control my sense of desperation: I wanted to say, wait a minute. Let's stop here: This is a Sentence. This is Not a Sentence. HIM is spelled with an _m_, not with an _n_. Words that sound like, or a little like each other are Not spelled the same way. For

> instance, along is not the spelling for alone . . . Shouldn't I "correct" them" How can you correct completely illiterate work without entering that hideous history they have had to survive as still another person who says: You can't do it. You don't know. You are unable. You are ignorant. So for the moment, I am not doing that. And the question is what am I doing?
>
> "(March 30, 1968) . . . As for the paper (The Voice of the Children), the kids were very upset about typing errors, and very concerned to have their stuff reprinted in correct form. There was a lot of asking about how to spell this and that, for instance. I have promised to arrange to have their work corrected before it appears in type. As the Collaborative knows, I regard this kind of thing as effectively pedagogic and therefore regard the kids' concern as most positive and forward moving.
>
> "(April 6, 1968) I spent most of my time correcting the work as it reached my hand; to the children it was particularly important to have their words as clear as possible."

The task for anecdotal reporting is to describe various ways students have become involved in writing, reading, and thinking about literature, and to describe some of the things that started happening.

"Cross-Checking" (Science)

Perhaps analogous in science to getting students to write is the task of getting students to perform computations. In teaching science, it is one thing to develop appropriate equipment for conducting open-ended experiments. It is a related but additional task to develop appropriate teaching practices to work with students using these materials. Many teachers report that one of the toughest tasks in the laboratory is to get students to see the importance of, and undertake, computations. They gather data willingly enough, but investigations tend to stop there. Teachers write:

Teacher L: "The excitement of the course always diminished when calculations had to be carried out to attach quantitative significance to the work. This has been due to the prior orientation of the students to look at things in a cursory manner. . .

"Students could not see any reason for investing so much time doing experiments and carrying out calculations to establish quantitative trends. Their favorite comment was, 'This should be left to the science majors.'"

Teacher M: "In the physical science part of the course, students showed the most apathy and lack of performance in the more mathematical aspects of the subject (uniformly accelerated motion, momentum, etc.) even though these aspects came rather late in the second semester. . . [Students] just did not care how many joules of work a car does in going to the top of a mountain."

A number of teachers abandoned the effort to get students to carry out calculations; they went on to other tasks. One teacher does report a method that served to motivate students to engage more willingly in computation. He called the method "cross-checking." The idea is, when there is a quantity to be measured, students should be able to measure it by more than one way, so that the answer obtained one way can be used as a check against the answer obtained the other way. The desire to compare results kept students working. Moreover, the procedure served to convince students that science is about something, that it really works. (The fact is, scientists are always looking for independent measures or definitions of the quantities they investigate.)

Two examples from a sequence of experiences reported by the teacher will illustrate this matter. The first example, the use of the stroboscope to determine the rate of rotation of a fan, shows the need for a motivational scheme. The second example, the measurement of the length of a football field, reports the use of cross-checking to motivate students.

Teacher N: "An electric fan was turned on and the class was asked how they could determine the rate of rotation of the fan. No one knew this. The hand stroboscope was introduced and suggested as one possible way to determine the rate of rotation of the fan. Several students took hand stroboscopes and started rotating them in an effort to see how they could determine the rate of rotation of the electric fan. A discussion evolved from this activity that lasted the rest of the class period. (Before the students left, a textbook and laboratory manual was issued to each.)

"The next day when the instructor entered the classroom, the majority of the class was using the hand stroboscopes. Through a discussion they finally took stopwatches and used them in conjunction with stroboscopes to measure the rate of rotation of the fan. The students enjoyed these activities so well that they got involved and did things on their own with little or no help from the instructor. They even told the other class about their work and generated enough enthusiasm to motivate them into trying to use the stroboscope and stopwatch to measure the rate of rotation of the fan before their class period began.

"This was the general attitude of students throughout this activity so long as they used a piece of apparatus to collect data. However, as soon as we began to actually carry out the calculations to find the rate of rotation of the fan from the data, the class turned off. They had considerable difficulty grasping the quantitative aspect of the activity and considerable time was spent in discussions with the students collectively and individually until they felt sure they understood how to do the calculations. Two days later when they were asked to solve some problems in the physics textbook on the stroboscope, they could not recall the method we had developed, so the instructor did a demonstration with the stroboscope to give the proper approach to solving the problems...

"The students had difficulty transferring their learning to any situation that was not identical to their classroom activity. For example, the class pulled a paper tape through a bell clapper (timer) and recorded the time interval over which this occurred, then calculated the number of vibrations the timer made per minute. When they were asked to determine the number of stitches an electri sewing machine made per minute, they did not relate this to the previous work they had done with the timer. . .

"An activity that held their interest even throughout quantitative calculations was the triangulation method which was used to determine the distance between objects. One of the students who had been exposed to similar triangles explained the triangulation to the class. The class went outside and measured the length of the football field using triangulation and checked this measurement using a measuring tape. Both methods were in agreement. This method of cross-checking gained the students' confidence and imparted a concrete appreciation for the triangulation method. Hence, activities where this approach can be employed should be used extensively to hold the students' interest."

It will be helpful to learn what experiences teachers have had this second year in motivating students to carry out computations. More generally, it will be helpful to learn some of the techniques teachers used in working with original scientific papers, open-ended experiments, and other components of the course.

Puzzles, Games, and Real Life Situations

In all fields the project seeks to involve the students directly in the activity being studied. In learning mathematics this means doing mathematics -- engaging in mathematical invention, analysis, generalization, and so on. Such instruction, so the theory runs, will prepare students better for situations in real life which are not covered by textbook formulas and for which the investigator must come up with ideas of his own. Also, when it is necessary for students to learn such basic skills as adding fractions, graphing, using exponents, etc., the approach in mathematics, again as in the other subjects, is to motivate students to master these skills, because they are needed for other tasks students want to accomplish.

These procedures are generally neglected in mathematical instruction today. Several persons in the program compared the approach in the Thirteen-College Project to that employed in the regular curriculum. The first person's remarks are based on reports from mathematics majors in his class who during the second semester sat in on a regular course.

Teacher O: "The regular courses depend too much on a knowledge of formulas which were learned the previous semester. The regular course teacher did not allow the students enough opportunities to work on problems on the board, and thus express their own approach to solving a problem. There was more emphasis on covering a certain amount of material and less emphasis on explaining the material covered. There is strong emphasis on thinking along the same lines as the teacher where this thinking could be flexible. In many cases, the teacher was very concerned with the final result and less concerned with the approach.

"Some positive attitudes were also expressed toward the regular program courses in mathematics; the most pronounced was that the accelerated students could move at the fastest possible rate."

Teacher P: "In the regular mathematics department these courses are outlined by the number of days to be spent on each topic. In many cases the instructors are pushed to cover certain topics in a given period of time. Because of this time factor, the instructors lecture on topics, assign given problems and recall certain problems and concepts on tests. The instructors do not have time for individual responses and participation in the classroom."

Although the boundaries are not hard and fast, it is possible in mathematical instruction in the project to distinquish several ways in which the objective is carried out of devising tasks that allow the student to wrestle first-hand with problems.

One approach is through problems arising in physical phenomena or real-life situations and drawing out the mathematics hidden there. This approach emphasizes moving from concrete situations to abstract thought. Themes exploited include life expectancy; estimation of the size of large collections of things, such as the number of flats being fixed at this moment; the motion of people walking; statistics of population; random events; balance beams.

A second approach is through topics traditionally taught in beginning mathematics courses, but getting into the topics through new routes, routes that enable students themselves to manipulate the mathematical elements, and pose and solve problems for themselves -- rather than running through a list of established results and offering the established proofs for those results.

A third approach is through a situation that is sort of half way between the real world and the world of idealization and abstractions -- the world of games and puzzles. Themes employed include both traditional games, such as tic-tac-toe, nim, whist, dice, plus variations and complications of the games, as well as the invention of new games by students and faculty.

An example of how one of these approaches, the second, works in practice is provided by one of the teachers. The traditional topic taught is that of linear equations; the new approach is based on some of the new work being done in the schools by David Page and others.

Teacher Q: "Typical of the more successful and innovative lessons in the course were the week long discussions of transformations on a line. Expressions such as $2x + 6$ were used to transform a given x to a value of $2x + 6$ so that 3 transformed to 12, 4 to 14, 5 to 16 and -4 to -2 (½ went to 7). These transformations were drawn in class as follows:

The overhead projector with a marking pen clearly presented the transformation "jumps:" In response to queries about what had a transformed value of zero (i.e. jumped to zero) students discovered methods, often unstated, that amounted to the solution of linear equations, such as $2x + 6 = 0$. To find a pair of numbers that gave "jumps" of equal lengths, students developed further intuitive solutions. When a fixed point (i.e. a number which transforms back to itself) was known, the equal jumps were symmetrically located to left and right of the fixed point. The method of determining fixed points for a given transformation rule evolved after considerable discussion. The student who stated the general rule for finding a fixed point gave the teacher his original knowledge of the rule, so that the teacher had a very real feeling of learning with the students. Class discussion proceeded to solving the problem when members of the class offered substantially the following sequence of generalizations:

Mr. B. "Equal jumps are spaced equally distant from the fixed point."

Miss M. "The zero jump is obtained by dividing the constant by 2." (This rule developed from working with a transformation such as $3x + 8$) Note: this rule suggests that the fixed number is $\frac{-8}{3-1} = \frac{-8}{2} = -4$

since -4 goes to $3(-4) + 8 = -4$.

Miss D. "The jump to zero is gotten by starting with the opposite of the constant and dividing by the coefficient of x."

Mr. B. "The fixed point (i.e. the number which gives a zero jump) is, in general, the opposite of the constant divided one less than the coefficient of x except when the coefficient of x is 1 and then there is no fixed point."

"When the teacher asked the student who gave this last and final generalization, 'How did you ever think of that?' The student responded, 'From what she said over there.' (i.e. the less general statement of Miss M.) She had given the appropriate statement for a simpler rule, and Mr. B just extended the rule to a more difficult transformation rule. He got the general solution to obtain fixed points for any linear transformation on a line."

A second teacher, viewing the methods of the course broadly, is less satisfied with the way things are going. He discusses the difficulties he has had, stressing the need to include material explicitly tying the mathematics studied in the course to the mathematics the students will need in subsequent courses and in future jobs.

Teacher R: "Student interest was high during most of the discussions, but when problems of a more rigorous nature were posed, most of the students became frustrated and interest waned. Students easily became involved in class discussions and were quite argumentative, but much of their arguments lacked substance and usually whenever the majority of them recognized attempts to give them substance, they rebelled and complained of being bored. Talking with students individually revealed that they were more afraid than bored. They lacked self-confidence because of deficiencies in their high school backgrounds, but because they had a great deal of pride, were fearsome of their classmates realizing these inadequacies. . .

"The complete discovery approach demands a degree of responsibility that most of our freshmen do not possess. Certainly, as many of the students complain, a limited high school background does impede their ability to discover, to think and to be inquisitive, but they do not have the courage, the confidence or the perseverance to independently attempt to eradicate these deficiencies. . .

"Students are in college searching for a means to step out of poverty -- to gain financial security. They must see mathematics in relation to their academic majors -- majors which will provide them with the appropriate training and skills needed to obtain a "good" job. While we certainly do not advocate a course in practical or applied mathematics, consideration must be given to the students' cultural, economic, and social, as well as academic background, in developing a curriculum which will motivate them to thirst for knowledge for knowledge's sake, to develop intellectual curiosity, and to become independent in academic pursuits.

"Mathematicians certainly appreciate mathematics for its aesthetic qualities, but students from a low socio-economic background are inclined to be more pragmatic. These students must feel a need for what they do. Many of them are accustomed to the bare essentials and necessities of life without any frills or adorments. While most of the students have enjoyed the "interesting" frills of mathematics, they feel a tremendous loss when they are required to have knowledge of the "basic essential" for applications to other courses and situations and to objective tests."

One task for evaluation is to determine whether these new approaches really can be carried out by teachers and whether they really create situations in which students wrestle first hand with the elements of mathematics. It will be helpful to have reports of just what the teacher did, and what students did. It will also be helpful to have comparisons among the different new approaches -- problems arising in real-life situations, traditional topics treated in new ways, the mathematics of games and puzzles. Also useful will be experiences related to establishing a balance, if such is needed, between the new approaches and more conventional treatment, or establishing a relationship between the two.

Decentralizing the Classroom

During the first year, the Thirteen-College Project made no central effort to experiment with classroom format -- the way in which teachers and students are grouped together. On each campus there were eight teachers to 100 students, the teachers meeting the students in groups of 25, each teacher meeting two groups, that is, giving two courses in the program. Several persons report interest in experimentation in format, or the difficulties posed for such experimentation by present facilities.

Teacher S: "Innovation is present only in the curriculum. In view of the difficulties experienced this year, I suggest a much more professional (not high school) outlook in the program. Tutorials of 5 students once a week, for instance, interchangeable at the professor's discretion would provide some flexibility."

Director T: "The original patterns, conceived to allow students to meet in large or small groups, or to shift back and forth between sections when appropriate, simply could not be effected because there were not enough rooms available at the prime hours. Laboratory space was available only in the mornings, project rooms for films and slides were available only at limited hours through the week. The consequence was that scheduling had to be done on the basis of room availability, not on the basis of an experimental idea."

At most of the participating colleges, students with greatly varying interests and backgrounds were all welcomed into the program and grouped together -- students planning to major in a subject, non-majors, and students needing work in basic skills in that subject. The conventional procedure these days for handling freshmen is some system of tracking. Although it depends to some extent on the subject, the majors take one course, non-majors another, and students needing help with basic skills go to a special remedial section. The rationale, in part, for grouping diverse students together is that students needing remedial work, as well as non-majors, require the same creative approaches as majors, while, on the other hand, majors are suffering from some of the same deficiencies as students needing work in basic skills. One of the teachers of physical science writes:

Teacher U: "It should be noted that the so-called science majors have many of the same ills as the non-science majors and many times find the course just as intriguing, for they have not developed critical skills to think scientifically. Perhaps the easiest way to spot the science major is by his memory of concepts and vocabulary."

A number of teachers commented on the diversity of the students they found in their classes and reported difficulties in doing justice to the needs of each. The answer in the project lies, in part, in developing materials sufficiently flexible that different students can use them in different ways. But the answer can also lie in experimentation in classroom format and some teachers did begin trying out new ways of grouping students.

A teacher of "Quantitative and Analytical Thinking" reports organizing and teaching several small, special interest groups -- more advanced mathematics for potential majors in mathematics and related areas, general mathematics for students who wished to improve their backgrounds, and instructions in using the slide rule. Another mathematics teacher reports less success in organizing and conducting special sessions.

Teacher V: "We were able for a short time to carry on special sessions with a small group of prospective majors in introducing trigonometry. It was not very successful because class meetings were irregular; the schedule was just too full to allow for consistent extra class meetings. Besides, the same students were rarely able to meet each time. However, the idea itself has merit."

Several teachers tried using tutors to help students having difficulty in the program. Teachers did tutoring themselves, used upper class students, and other students in the program. One common complaint was that the students who needed help most would not come to sessions. One teacher had a suggestion for the second year of the program: use sophomores in the program as tutors for freshmen.

During the 1968-69 academic year, the people in mathematics are conducting a concerted experiment in classroom format. Instead of having the whole class working together on the same problem at the same time, they hope to provide sufficiently varied and flexible instruction that each student, either alone or in small groups, can find something that really interests him. The experiment is called "decentralizing the classroom." The task is to develop, and so have on hand, a great number of physical situations, puzzles, games, and other challenges, from which mathematics can be developed, and to learn how to manage a classroom in which different students are doing different things.

Questions for evaluation include, how effective is the program in meeting the needs of the diverse student body? Is decentralizing the classroom part of the answer to this problem?

THREE: THE QUESTIONS: 1968-1969

The previous section serves as background reading for the present section. Suggestive questions were scattered through the narrative, but rather than go back through that material again, collected here are the kinds of questions previously raised.

The first group of questions seeks to take inventory of the various kinds of materials used in the project.

1. Written Materials Used. Please give the titles of all the works you used in class during the year (e.g., books, magazines, newspapers, scholarly journals, reprints, material duplicated specially for the project, student papers).

   If you used only part of an item, indicate which part.

   Is the item generally in use in the project? Is it something you yourself introduced in the course of the year?

   In what quantities is the item used? Was it purchased for students? by students? borrowed from the library or other sources?

2. Office Equipment Used. Please state the pieces of office equipment you used during the year (e.g., typewriter, mimeograph machine, ditto machine, thermofax copier).

   Is the item generally in use in the project? or something you introduced in the course of the year?

   In what quantities is the item used? Was it purchased or rented with project funds? or obtained from the college or other sources?

3. Audio, Visual, and Laboratory Materials, and Field Trips Used. Please give the titles or appropriate designations for all the works you heard, saw, handled, or visited during the year (e.g., tapes, records, films, film loops, film strips, slides, laboratory kits, mathematical games, computers, calculators, street corners).

   Is the item generally in use in the project? or something you yourself introduced in the course of the year?

   In what quantities is the item used? Was it purchased or rented with project funds? or obtained from the college or other sources?

4. Projection and Basic Laboratory Equipment Used. Please give the principal equipment used to hear tapes, show films, view slides, visit places, do laboratory work (e.g., tape recorder, record player, overhead projector, slide projector, film projector, film-loop projector, cars, buses, and basic laboratory equipment such as microscopes and acquariums).

   Is the item generally in use in the project? or something you yourself introduced during the year?

   In what quantities is the item used? Was it purchased or rented with project funds? or obtained from the college or other sources?

The next group of questions seeks to gather general impressions about the efficacy of the project. Please bear in mind the student goals in answering these questions. How much does this or that aspect of the project contribute to this or that goal? As a reminder, here are the five student goals:

Become involved in project activities,
Learn skills including basic skills,
Learn to think, develop taste and judgement,
Learn something important in subject area studied,
Develop positive attitudes towards oneself and learning.

5. General Observations on Themes, Subject Groupings, or Story Line. Please compare the approach based on themes, etc., to conventional approaches (e.g., "Choice and Temptation" vs. grouping by literary genre or by chronology; "Structure of Matter" vs. survey of topics that make up the field; "Evolving Mathematics from Non-Mathematical Contexts" vs. mathematics starting with the symbolism and framework already set; "American Cities and Urban Problems" vs. Introductory Sociology and Introductory Economics and American History), in terms of achieving student goals.

   Of the themes, subject groupings, or story lines you discuss, indicate whether they are in general use in the project, or whether they are something you introduced in the course of the year.

   In answering this question, you may want to compare one project theme to other project themes, or you may want to compare a theme in the project to one or more topics chosen for instruction in the regular college program.

   Is the approach based on new themes, subject groupings, or story lines over emphasized? not sufficiently exploited? used in the right amount?

6. General Observations on Written Materials. Compare the selection of reading materials used in the project to that in the regular curriculum, in terms of achieving student goals.

   You may want to compare a few items in the project to each other, and then to reading materials in the regular program.

   Is the stuff exciting or dull? readable or unreadable, too contemporary? too many selections from popular culture? too much high art? too much reading as a whole?

7. General Observations on the Logistics of Books, Office Equipment, and Reading Environment. What special logistical problems if any, are posed by the use of written materials in the project -- locating, duplicating, purchasing, shipping, storage, distribution to teachers, distribution to students?

   How accessible to you are the duplicating equipment, office services, etc?

   How satisfactory are student facilities for reading, writing, studying, taping, talking, buying books?

8. General Observations on Audio, Visual, and Laboratory Materials, and Field Trips. Give your general impression of the use of audio, visual, etc., materials in the project.

   Is this a necessary addition to reliance on written materials? You may want to offer comparisons to parallel written materials in the project; you may want to compare particular films or pieces of equipment to each other; you may want to compare items used in the project to audio, visual, etc. materials used in the regular program.

   Are these materials over emphasized? not sufficiently exploited? used in the right amount?

9. General Observations on the Logistics of Audio, Visual, etc. Materials and Laboratory Environment. What special logistical problems, if any, are posed by the use of audio, visual, etc. materials -- requisitioning, purchasing, shipping, storage, distribution to teachers, making available to students?

   Are the necessary items to be viewed or heard or worked with -- and the necessary pieces of equipment -- on hand and in working condition?

   Is adequate laboratory space available to students? Is the laboratory open extra hours?

10. General Observations on Teaching Practices and Techniques. Compare the teaching practices employed in the project to those employed in the regular program (e.g., "Chamber Theatre" vs. book reports; investigative reporting on "Street Corners" vs. library papers; "Decentralized Classrooms" vs. everybody doing same thing at the same time; "Open-ended experiments" vs. demonstration of results previously established), in terms of achieving student goals.

Are the practices you employed generally in use in the project? or something you yourself introduced in the course of the year?

You may want to compare some of the new practices to each other, and you may want to compare these practices to those employed in the regular college program.

Are the new practices over emphasized? not sufficiently exploited? used in the right amount?

11. General Observation on General Observations. As a teacher, what effect has the project had on you? and you on the project?

The next question seeks a detailed anecdotal account of some experiences illustrative of the preceding general observations. If you have an interesting experience, please describe it fully. Do not worry about writing too much. Detail is appreciated. The last question gives teachers an opportunity to raise questions so far overlooked.

12. Some Detailed Accounts of Classroom Activities. Pick several (this need be only one, two, or three) activities that you undertook in the course of the year that particularly impressed you, either because they worked so well or turned out so poorly, and describe what happened.

What did you do? What were the consequences? WHY? What did students learn or fail to learn, in terms of student goals? WHY?

Some of the longer excerpts by teachers quoted in the earlier sections of this document illustrate the kind of reporting needed. See especially the following teachers on the indicated pages: E (17), F (17), G (19), D (28), B (48), B (55), F (58), I (61), N (77), Q (80).

13. Anything Else? If questions about the curriculum -- or other aspects ofthe project -- have occurred to you that do not fit easily into the previous questions, please pose your questions here and give your replies.